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THE
GEOGRAPHICAL REVIEW

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A PROPOSED AËRIAL EXPEDITION FOR THE EXPLORATION OF THE UNKNOWN INTERIOR OF NEW GUINEA

By ERIC MJÖBERG, D.Sc.
Secretary to the Natural Science Society, Stockholm
Leader of the Swedish Scientific Expeditions to Australia, 1910-11 and 1912-13

Among the very few tropical regions of the earth that still retain to any considerable extent their "white spaces" New Guinea is the most noteworthy. Within the tropics there is no other area that has been, for so long a time, the object of systematic and strenuous exploration. Nowhere else has the onward-pressing explorer encountered such stubborn resistance as when he has tried to remove the mystic veil that still shrouds the interior and endows it with the charm peculiar to the unknown. Since the time when, in the dim, far-away days of the sixteenth century, the island was once sighted by Jorge de Meneses, a Portuguese driven out of his course by hard weather, nearly a thousand different explorers, single-handed or as leaders of strong and well-equipped expeditions—which at times have been of an international character and composition—and actuated by various motives, have set about the exploration of this great island. Nevertheless the fact remains that New Guinea, with its still unknown interior, is, within the tropics, the largest "white space" on earth.

Hardly a year passes without discoveries of the most sensational kind being made in this part of the world. Only a year or two ago, in the Dutch part of the island, there was discovered a large new oviparous mammal, an ant-eating porcupine, about a yard in length. In 1910 the expedition sent out to the Dutch part of the island by the British Ornithologists' Union, under the leadership of Mr. Walter Goodfellow, put on record the existence of a new race of men, the so-called Tapiro dwarfs, living on the heights of the Nassau Plateau. And it was only a few years ago that the well-known Dutch explorer, Dr. Lorentz, after two previous but unsuccessful expeditions, succeeded in reaching the long-desired goal, Wilhelmina Peak in the

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central range, 15,585 feet high. He is the first white man to have set foot upon New Guinean snow.

As early as 1910, during my first expedition to Australia,[1] New Guinea already loomed before my fancy as the future object of my exploratory work. This idea grew upon me more and more, especially after I met in 1912 and 1913, at Brisbane, Sir William McGregor, the Governor of Queensland.

Among living explorers Sir William McGregor is, without doubt, the one who possesses the most intimate knowledge of New Guinea. In the long period from the early eighties to 1900 he made a series of journeys within the British part of the island for the purpose of studying it. Later, in his capacity of Lieutenant-Governor, he did much traveling, for practical purposes and on duty, but always with an eye open to the possibility of fresh discoveries. In 1906 and 1908 he climbed the highest summits of the littoral Owen Stanley Range, 13,000 feet in altitude, and also succeeded in traversing the southeastern peninsula.

Sir William McGregor strongly advised me to devote my exploring work in the future to New Guinea, where to this day so much that is still unknown remains to be revealed. I have accordingly been revolving this suggestion in my mind more and more and herewith present a plan of exploration which promises useful results.

Geographical Features of New Guinea

International Partition.—New Guinea is, as we know, divided among three nations: Holland, Germany, and Great Britain. All territory west of longitude 141° E. belongs to Holland. The boundary between British and German territory follows a broken line, dividing the eastern half lengthwise. The final partition of the island took place in 1884, when the German portion, which up to that time had only been a protectorate, was proclaimed a crown colony. The British part of the island—also called Papua, or "the Territory"—was incorporated with the Commonwealth of Australia in 1901, and later, by a special act of November 16, 1905, the so-called "Papuan Act," the country was placed under a Lieutenant-Governor subordinate to the Governor-General of Australia.

Topography.—New Guinea is situated just south of the equator, between the parallels of 0°19′ and 10°43′ of south latitude, and extends in an east-southeasterly direction from 131° to 151° east longitude. With its area of 300,000 square miles, it is larger than the Scandinavian peninsula and is, next to Greenland, the biggest island in the world. In the east, as in the west, it forms peninsulas. Eastwards, New Guinea is continued by several large groups of islands, Neu Pommern and the Louisiade Islands,

[1] Cf. the writer's account: Svenska biologiska expeditionen till Australien, 1910-1911, *Ymer*, Vol. 32, 1912, pp. 397-434; and his "Bland vilda Djur och Folk i Australien" [Among Wild Animals and Peoples in Australia], Bonnier, Stockholm, 1915.—Edit. Note.

and farther east by the Solomon Islands. Taken together with the latter it may be considered the remains of a former connected land complex. It is separated from Australia by Torres Strait, 96 miles in width. The two large bays, Geelvink Bay in the northern part and the Gulf of Papua in the southern, naturally divide the island into a central main land and two peninsulas.

The northern coast of New Guinea is mostly steep and high; in other parts the shore is flat and fringed by low-lying, swampy mangrove forests,

Fig. 1—Sketch-map of New Guinea.

extending inland for many miles. There the country is very broken and rugged, and intersected by high ranges of hills with valleys and plateaus between. The northwestern peninsula is ridged by a chain of high mountains, the Arfak Range (9,500 ft.). Beyond the neck of the peninsula and continuing to the east are the Charles Louis Mountains and the Snowy Mountains, or, as they are called nowadays, the Nassau Range, culminating in the snow-clad summits of Mount Idenburg (15,270 ft.), Carstensz Peak (15,706 ft.), and, farther east, Wilhelmina Peak (15,585 ft.) and Mt. Juliana (14,665 ft.). To the east of these are the Victor Emanuel and Sir Arthur Gordon Ranges, both close to the Anglo-German border. Still farther east we find the Bismarck Range, which is often covered with snow, and, forming the southeastern peninsula, the mighty Owen Stanley Mountains, the highest peaks of which are Mt. Albert Edward (13,100 ft.) and Mt. Victoria (13,150 ft.). Thus it will be seen that, from west to east,

a more or less connected system of mountains intersects the interior of the island, like an immense backbone.

As to the interior of the island, it is as yet practically unknown, but from the highest peaks that have so far been climbed the presence of still loftier mountains, with peaks mantled in dazzling white snow, and, intervening, less elevated expanses of ground have been revealed.

From a geological point of view, the island is very imperfectly known. However, we have reason to believe that the lowland south of the central ranges is in age and structure related to the older lands of Australia, while the ranges themselves are of more recent age and are akin to the partly submerged mountain arcs characteristic of eastern Asia. The relatively recent volcanic activity of the northern coast and the Bismarck Archipelago seems to attest this.

Climate.—As New Guinea is situated very nearly on the equator, its climate is hot and damp. At least, such is the case in the coast regions, so far the only parts fairly well known. But since from the heights of the coastal ranges lofty mountains may be seen, the summits of which are capped with snow, glaring white in the tropical sun, it follows that in the highlands of the interior a temperate climate must prevail. The mean temperature for the year is given as 79° F. On the north coast the warmest month of the year is March, with a mean temperature of 79°; on the south coast December is the warmest month, with a mean temperature of 82°. The coldest month is August, with a mean temperature of about 77°.

During the months of May to November—in the southern tropics the winter period—the southeast trades blow with unvarying strength, bringing a copious rainfall in parts. During the rest of the year, which constitutes the summer, the northwest monsoon sets in, frequently deluging the northwestern and western parts of the island with tropical cloudbursts and violent and persistent torrential downpours.

In the southeastern parts a dry season prevails during the winter, but such is not the case on the north coast, where rains fall every day in the year, often accompanied by violent electric discharges. This coast accordingly shows the heaviest rainfall, namely 79 to 118 inches, varying according to locality. Higher up in the mountains considerably more rain falls, and it is definitely stated that, in places, as much as 382 inches has fallen in a year. In especially wet years the rainfall in the low-lying parts has varied from 197 to 236 inches.

As a natural consequence of the enormous rainfall, mighty watercourses traverse the country on their way down to the sea. The largest river in the island is the Fly River, in British territory. Its sources are not yet known, but they are probably to be found in the mountains on the Anglo-German border. This river drains an area of enormous extent. The length of its course from the sea to the Anglo-German border is estimated at 620 miles. It is navigable, at least for motor boats, for about

500 miles. It is under the influence of the tides as far as 200 miles from its mouth. All along its course the banks are covered with dark and dense primeval forest. The volume of its waters is very large. Other great rivers are the Markham, discharging into Huon Gulf; the Ramu, with its sources in the Bismarck Mountains; the Kaiserin Augusta, or Sepik, River, which drains large regions of the north, and, with its tributaries, extends up to the Victor Emanuel Mountains; and the Mamberamo, which, with its affluent, the Idenburg River, drains the northern slopes of the central range in Dutch New Guinea.

As far as we know, no stagnant bodies of water are to be found, but it is nevertheless highly probable that there are some lakes in the level parts of the interior. In the following pages I shall return to this question in connection with another matter.

Vegetation.—Bearing in mind the equatorial position of New Guinea and its humid climate, it is to be expected that its vegetation would be of a very luxuriant character. A dense and uncompromisingly tangled primeval forest covers the greater part of the coast land, as well as the rising ground towards the mountains for a considerable distance. This "bush" bears a striking resemblance to the jungles of Queensland, although a stronger admixture of Indo-Malayan elements is noticeable. The coasts are edged with a belt of swampy mangrove forest, several miles in width, which at low water exposes a tangled network of main and auxiliary roots covered with slimy mud. Wherever one may look the eye is met by dark and dense primeval forest, with here and there a patch of lighter color. Such patches are grass-grown and are known by the name of *alang* steppes; they will be referred to again later.

At an altitude of about 10,000 feet the bush begins to show signs of becoming more sparse. The trees are hung with moss, all damp and dripping, and new elements begin to intrude themselves. Another ascent of 1,500 feet and the tree limit has been reached. Primeval forest gives way to an inferior kind of brushwood vegetation, with a dense undergrowth. Another thousand feet upwards, and an alpine vegetation appears, with fine greenswards and flattened plants of a northern alpine type.

Animal Life.—Leaving the vegetable kingdom for a cursory glance at the fauna of the island, we find that animal life in New Guinea is quite individual, even if obvious points of contact exist, on the one hand with the Malay Archipelago, and on the other with Australia. Of the mammals a good many are arboreal, but kangaroo types are also found in the parts where the country is more or less open. Two species of ant-eating porcupines are indigenous to the island; one of them attains a considerable size and, as has already been mentioned, was only discovered a year or two ago in the Dutch part of the island. Other mammals found here in a wild state are rats, bats, and a species of pig.

As is well known, New Guinea is pre-eminently the land of birds of

paradise. In the silent depths of the primeval forest they display a wealth of color and a variety of shape which is without parallel in the animal kingdom. Wallace emphasized the greater splendor of this bird fauna as compared with that of Brazil. More than sixty species are indigenous to the island. Only one species has spread to Australia.

FIG. 2—Tapiro pygmies of New Guinea compared in stature with a white man. (From Capt. C. G. Rawling's "The Land of the New Guinea Pygmies," London, 1913.)

The rest of the indigenous bird life is also wondrously developed. In New Guinea parrots are found of the most varied colors and shapes. The smallest is of the size of a tomtit. Another comparatively ancient group are the pigeons, of which no less than thirty-nine distinct species live on the island. Six of the local bird families are, as to their habitat, restricted to the Australian-Papuan region, viz. the cockatoos, birds of paradise, cassowaries, Megapodes, Meliphagides, and the Podargides.

Population. — As is well known, New Guinea is the country of the Papuans. Terminology and grounds of classification have long been in a state of confusion and incommensurability. But it has become more and more customary to class as Papuans only the natives of New Guinea proper and of several adjacent islands. The natives of the Bismarck Archipelago and the Solomon Islands belong to the Melanesians, of which race also were the now extinct aborigines of Tasmania. The aborigines of Australia, on the other hand, form a distinct and typical group of their own.

As regards the Papuans, there has in the course of time taken place a considerable intermingling with other races. In the western parts there has been an infiltration of Malayan and Mongolian elements; in the northeast, of Melanesian, and in other parts, of Semitic strains. There has also

been blending with the dwarf peoples. All this has resulted in making the anthropological questions particularly complex.

In mental development the Papuan is far superior to his neighbor to the south. Unlike him, he has attained the status of an agriculturist. He has learned to take thought for the morrow. He has emerged from the nomad stage and has become a dweller in fixed abodes. His huts are grouped together in village communities, and the first steps toward social specialization are undeniably evident. With tools of a primitive kind he cultivates the land about his huts. His domestic animals are the dog and the pig.

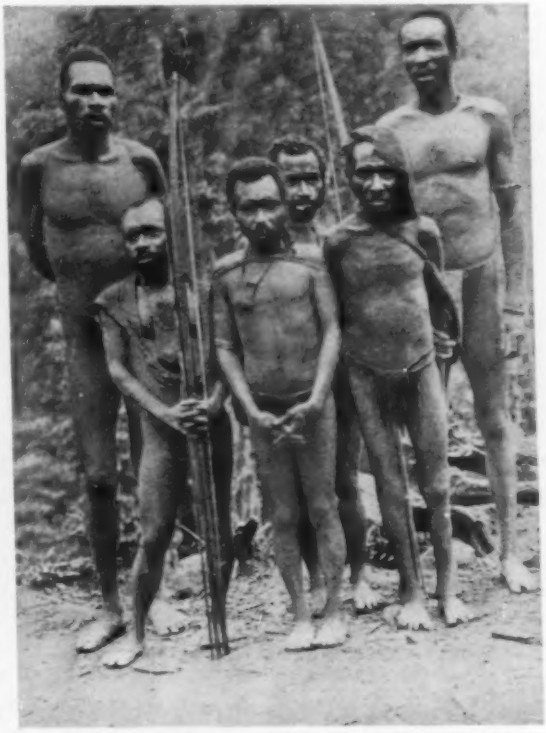

FIG. 3—Group of Tapiro pygmies of New Guinea, with two coast Papuans in the background. (From Capt. C. G. Rawling's "The Land of the New Guinea Pygmies," London, 1913.)

The Papuan is an artist of no mean ability. What a difference between the rude and primitive utensils of the Australian aborigine and those of the Papuan, which are tastefully ornamented or artistically plaited; or the beautifully and richly carved canoes, spears, bows, drums, masks of many kinds, mummies, etc., not to mention the so-called "spirit houses," wherein are deposited all sacred and ritual objects.

The hut of the Papuan is originally of a circular type, but the most varied modifications are to be seen. The hut is always built on pillars. In this way it is raised above the damp ground, and at the same time is rendered safer from enemies. The space underneath is utilized as a stable for the domestic animals, as a store-house or depository, or for similar purposes. The roof of the hut rests on one central pillar, or it may be supported by several. Roof and walls are built of poles, together with thick layers of wood-fiber and bark, interwoven with withes of the rattan palm, plaited around and between the building materials.

The floor of the hut may even be placed on pillars of such a height that the owner is obliged to make use of a small ladder in order to reach it. We find that this idea of elevated dwelling-places has been carried to its furthest development in actual arboreal habitations. High up in the top of a big tree quite a little village may be located, well protected against the attack of an enemy.

Along the coast, and in swampy regions the natives live in pile dwellings. Here they lead the primitive life of the fisherman.

Social relations between individuals, sexes, and tribes are of a varied character. As a rule, the natives occupy separate houses according to age

FIG. 4—"Spirit," or ceremonial, house, Sissanu, western part of northern coast of German New Guinea. (Figs. 4-7 and 9-12 are from R. Neuhauss' "Deutsch Neu-Guinea," 3 vols., Berlin, 1911.)

and sex: the married women in one hut, the unmarried in another; the young men in one, and the married men in another; the elders in another, and so on.

Woman's social position is a somewhat lowly and oppressed one. Polygamy is allowed, but in practice is only indulged in by those who are well off, such as the chiefs, the witch doctors, etc. The wife is acquired by purchase, and is bought by the tribe. To her alone is acknowledged the ownership of her child, which the husband imagines to be once for all ready-made in her body.

A particularly interesting phenomenon to be observed in New Guinea is the sporadic appearance of dwarfs. They may generally be looked upon as instances of atavism. Up to about 1910 only solitary individuals, here and there, were known, but the subsequent discovery of the Tapiro dwarfs and the Goliath dwarfs—living in the mountains of that name in the Dutch territory—has established the existence of pygmy tribes.

We find that pygmy races appear in more than one part of the world. Even the ancient Egyptians told of pygmy peoples of the central and southern parts of Africa. Pygmies have long been known to exist in the Indo-Malayan regions, likewise in certain parts of Oceania.

From the existence in widely separated parts of New Guinea of cases of typical atavism, the conclusion was very properly drawn that, in the past, pygmy races were much more widely distributed than is the case in our own times. This was fully confirmed by the discovery of the above-mentioned two pygmy races. It is obvious that the pygmies would have to fall back when crowded by a race which was by far their superior in stature and bodily strength. And that such must have come to pass is shown by their occupation of the remote slopes of the Nassau Mountains, where no Papuans have settled, and by their not being met with, in any compact groups, in the coastal regions occupied by the Papuans.

The Tapiro dwarfs are distinctly a nation of hunters. They roam the mountains, armed with their bows and arrows. However, our knowledge of these people is, unfortunately, only very fragmentary. They live in a small village situated several hundred feet above the Tapiro mountain. When first seen by white men, they were exceedingly timid, and hid away all their women and children in the hills above their village. By degrees they became more accessible. They seem to maintain peaceful relations with their nearest Papuan neighbors. They walk about quite naked except for a girdle from which a fringe hangs down. They carry bags made of fiber, in which they keep all their movable property. They still use stone hatchets. They live in square huts, built on poles, with walls made of split tree-stems. Here and there they have tilled the soil and carry on the cultivation of bananas, taro, and other edible vegetables acquired by barter from the Papuans.

As to how the interior of the island is peopled, or if it is peopled at all, we know nothing. It has, however, been conjectured, and on very good grounds, that the numerous plateaus and valleys of the central parts of the island may prove to be inhabited by people of pygmy race, of whom we know nothing as yet. Mayhap descendants of the aboriginal inhabitants of the giant isle still live here. A rich and highly interesting field probably here awaits the fortunate pioneer explorer.

A matter of the very greatest interest is the fact that in New Guinea have been found indisputable traces of a prehistoric population. The fact is that in various parts of the island ethnographical objects of great age have been discovered, which are quite unfamiliar to the present inhabitants of the country. Their existence was first brought to light by Professor Neuhauss,[2] than whom no one is better acquainted with the German part of the island.

[2] R. Neuhauss: Deutsch Neu-Guinea, 3 vols., Reimer, Berlin, 1911 (reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 220-221).

The most interesting of these are perhaps the stone troughs, or mortars, with their pestles, which have been found in the region round Huon Gulf. They are of considerable size, and were evidently used for pounding hard substances or objects. What these objects may have been is not known. The natives of our own day have no use for stone mortars of this description, as they are not in the habit of pounding, or crushing, the harder kinds of seeds, fruits, or other requisites.

FIG. 5—"Spirit," or ceremonial, house, Malol, western part of northern coast of German New Guinea.

Among other things from archaic times there are some smallish images of stone, ornately sculptured, which, according to Neuhauss, show an artistic taste and skill of such high quality that it may be taken to be quite out of the question that the Papuans of our own time could have been able to produce anything like them.

It is also probable that the stone hatchets still in use by the natives —although in our own days becoming more and more scarce—have belonged to an earlier, more primitive people. We do not know the locality where a single one of these tools has been manufactured, although the natives themselves tell us that they are made here, there, and everywhere—but without being able to point out any definite spot. Their archaic patination and otherwise old-time appearance indicate that they date from a past era.

The fact is thus established that New Guinea, also from an ethnological point of view, offers a multitude of unsolved problems. As yet we do not know anything of the mountain peoples who, in all probability, are to be found in the interior. There, perhaps, will be found the key to many of the anthropological riddles—as difficult of solution as they are interesting—that present themselves in the great island.

OUTLINE OF PROPOSED EXPEDITION

Since, then, the compact belt of dense, swampy, and malaria-infested,

primeval forest encompassing the highlands of the interior to this very day remains an impenetrable barrier, I have for many years past been thinking over a plan for reaching the interior by way of the air. Thus there would be eliminated at one stroke all the hardships and privations, well-nigh beyond human endurance, which are inseparably attached to the forcing of a passage through the coast belt.

FIG. 6—Tree-house in German New Guinea.

It is well known what extraordinary progress has been made in modern aviation, particularly during the past two years. There is hardly any exaggeration in saying that man has conquered the air. One need no longer doubt the strength, carrying-power, reliability, and navigability of modern aëroplanes. At the western war front it happened only lately that two aviators, at an altitude of 13,000 feet, engaged in a sharp fight, which resulted in one of the combatants, damaged by his opponent's gunfire, falling headlong to destruction. Even in 1910 such an occurrence would have been deemed a sheer impossibility.

By the adoption of powerful, fixed engines, two or more in number, missing of the motor—formerly of common occurrence, and the cause of many a disaster—has become more and more rare. In this eventuality the sole means of safety has, so far, consisted in descent by volplaning, and then only provided a suitable landing place was within reach.

My idea is to find, by means of aëroplanes, practicable landing places in the interior of the island whence communication could be established with one or more depot camps at the coast.

The solution of this problem I have in the main conceived as follows:

One machine should be built especially adapted to carry heavy freight. This should be a powerful, multicylinder biplane of a special type, to seat

five passengers and to carry ballast of a minimum weight of 1,000 pounds. The building of a machine to meet these requirements would not in any way be difficult. The other machines should be biplanes of much lighter construction, seating only a pilot and an observer. The primary and most important business of these machines would be to search out and report upon possible landing places in the interior.

FIG. 7—A native (Papuan) of Bukaua, northern shore of Huon Gulf, German New Guinea.

Having located and fixed upon a suitable alighting place, the lighter machines would return to the depot camp at the coast. Thereupon, when meteorological conditions are as favorable as possible, the larger, freight-carrying machine would proceed to the selected landing place and discharge passengers, a first instalment of equipment, and provisions. This done, it returns to the depot in order to go back again to the inland camp without passengers, but with a full load of supplies. Regular trips between the two camps would subsequently be made as required, moving provisions and equipment from the coast to the inland camp, and returning with collections from the interior, to be immediately taken in hand and packed by the staff at the coast. Here would be stationed the lighter machines and their pilots, in constant readiness for duty.

The inland camp could be maintained until the surrounding country was carefully and systematically explored and mapped. With this done the camp could easily be moved to some other suitable site, and from this new center fresh exploration and research could be carried on. Once a satisfactory base has been established in the interior great possibilities are thrown open for exhaustive research work for a number of years to come.

Such matters as suitable machines, petrol, hangars, etc., are, as I shall show in what follows, easily disposed of, and of quite secondary importance to another matter which is momentous and decisive, that is, whether it is possible to land at all in the interior.

As early as three years ago, when I first met Sir William McGregor in Brisbane, I discussed with him, at length and in detail, my plan for an expedition into the interior of New Guinea by way of the air. He took

up this novel idea with great interest and considered the project well within the limits of possibility. To my question as regards landing prospects he told me that for his part he considered there existed especial facilities, to judge from the character of the country in the highest parts of the Owen Stanley Range, which he had been the first to visit.

FIG. 8—A Tapiro pygmy of New Guinea. (From A. F. R. Wollaston's "Pygmies and Papuans: The Stone Age To-Day in Dutch New Guinea," London, 1912.)

Thanks to Sir William's researches we now know that the tree limit —i. e. the line above which the primeval forest does not extend—on the coastal mountain ranges begins at an altitude of about 11,500 feet. Above this height vegetation becomes more and more sparse, with dwarfed trees and low-growing brushwood, gradually changing into alpine meadows of soft grass, and prostrate herbs. When Sir William approached altitudes of 13,000 feet he met with a very quaint vegetation, in many respects reminiscent of the Alps and of northern Europe. Here, practically on the equator, he regaled himself with strawberries picked off the grassy lawns. He saw here several old acquaintances of his childhood: lady's mantles, with crystal dewdrops sparkling in the tropic sun, alp roses of the well-known rhododendron family in a variety of species, *Pedicularis, Lactuca, Leontodon, Myosotis, Ranunculus, Hypericum, Epilobium, Galium, Gentiana, Senecio, Veronica, Potentilla,* and other familiar northern forms.

In the interior, where highland plateaus with peaks covered with dazzling white snow predominate, the climate is bound to be considerably

more temperate. From this it may be inferred that the tree limit will be found at a correspondingly lower altitude. In any case, the alpine meadows of the interior are sure to be far more widely distributed, and herein we see *the first of the landing possibilities on which we are reckoning.*

It is extremely probable that there is no connected forest belt in the interior. Indeed, it may be strongly doubted whether the primeval forest, composed as it is of Indo-Malayan elements, has been able to extend beyond and above the coastal ranges that shut off the interior of the island. It is, on the contrary, most probable that there will be found open savannas,

FIG. 9—Women potters, Laukanu, German New Guinea.
After the pebbles have been kneaded out of the clay, it is shaped into rolls 8 to 12 inches long (note the woman on the left; a number of rolls may be seen on the right edge of the photograph). These are bent into rings and placed one above the other to make the first rough form of the vessel.

sparsely dotted with gum trees, i. e. bush of North Australian character, and with the ground covered with soft grass. Moreover, such patches of eucalyptus bush are known to exist in the coast forests of New Guinea, where they appear, here and there, hemmed around by the dense and gloomy jungle.

There is reason to believe that the primeval forest in its compact form has not become predominant in the interior. The high coastal ranges and a more temperate climate must here have constituted a hindrance to its progress. On the rises and in the valleys there will probably be found open plains or thinly wooded forests, and thus we may count upon *a second possibility of landing.*

From our actual experience of the island—though, so far, very slight—we already know of the existence, here and there, of open, light-colored fields, some of them measuring many miles across. At first they were thought to be grass-grown, sun-bathed meadows, but this illusion was soon dispelled when the real nature of these lighter patches became known,

Fond hopes had been entertained that these tracts might some time be thrown open to cattle-rearing and agriculture. It was found, however, that the presence of these open fields was a sure sign of a barren and sterile soil, as they were only covered with a stiff and harsh kind of grass, the so-called *alang* grass (*Imperata arundinacea*), which in the dry season stands parched and yellow. On these plains a landing would not be practicable off-hand, but by dropping fire-bombs from the smaller, scouting aëroplane the grass could easily be burnt off, and in that way suitable landing places would be ready in a few days. Thus we have here *a third, and very excellent, possibility of landing.*

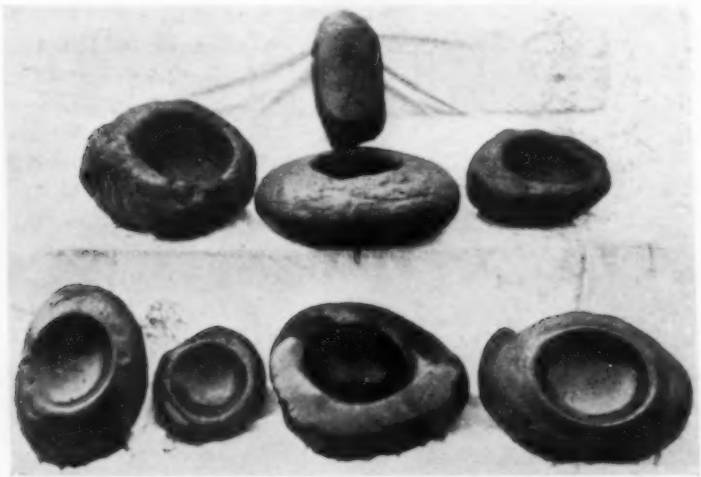

FIG. 10—Stone mortars, relics of prehistoric inhabitants of New Guinea.

By the foregoing I have shown that three different possibilities exist in the way of landing, viz. the open alpine meadows, covered with soft grass and low-growing herbs; the open or thinly wooded savannas that will probably be found in the interior; and, lastly, the *alang* steppes that are scattered here and there.

Personally, however, I am of opinion that a fourth possibility presents itself, and a most excellent one. In a country of so mountainous a character as New Guinea, with snow-clad peaks attaining a height of nearly 16,000 feet, and valleys in between, inland lakes are bound to exist. That such may be found even in the densest jungle was taught us by our experience in the primeval forests of Queensland, of which I have personally a thorough knowledge. In those jungles, quite unexpectedly, one comes upon splendid and gleaming sheets of water, mirroring the dark mass of the primeval bush by which they are walled in on all sides. They are of volcanic origin, or so-called crater lakes. Now that we know how intense

volcanic activity has been, and still is, in New Guinea, it would surely be very strange indeed if such lakes did not exist in an area that is larger than the Scandinavian peninsula. It is also most probable that lakes of non-volcanic origin are to be found in the interior.

Here, then, lies before us *a fourth possibility of landing, i. e. by alighting with a hydroplane on some inland lake.* Hydroplane floats should accordingly be included in the equipment. They could easily and quickly be fitted to the larger biplane, which, though originally designed for alighting on land, would thereby immediately be converted into a hydroplane; also for the lighter machine, floats should be taken for an emergency. To find and locate what inland lakes might exist, as well as landing possibilities in general, would be the lighter machine's principal and most important task.

FIG. 11—Prehistoric pestles, made of lava, from Bukaua, German New Guinea.

Wireless telegraph apparatus should also figure on the list of equipment. It could be erected at a reasonable cost. The importance of a wireless station is obvious, as thereby daily communication could be maintained between the inland camp and the depot at the coast.

The equipment should also include instruments for scientific observations, such as fixing positions, mapping, meteorological research, etc.

The composition of the proposed expedition and the duties of its members should, it seems to me, be as follows:

My own work would be generally to supervise the journey and progress of the expedition, and in particular to lead its scientific work, at least to begin with, until it had been ascertained whether it is possible to establish a base camp in the interior. This done, we could at once see about adding one or more specialists to the staff; first of all, a botanist and a geologist.

Four expert and experienced airmen should be of the party, as well as three well-qualified mechanics. They would constitute the flying staff of the expedition, but would naturally be very useful in other kinds of work when not actually engaged in their professional pursuits.

Two experienced topographers, either army staff officers or other persons

proficient in surveying, should be of the party. To them would be entrusted the task of mapping the territory covered, not only by the methods that are generally employed, but also from the air by means of phototopography, and with a cinematograph. These more modern methods have, of late years, been used with great success. It is easily seen what an excellent opportunity here presents itself—whilst sailing over the expanses in an aëroplane—of taking bird's-eye views that afterwards could easily be made into maps.

Because it is proposed to make as full a collection as possible of zoölogical and botanical specimens, an expert taxidermist would be needed. He might also assist in other work.

FIG. 12—Stone clubs in use by the present natives of New Guinea, but probably dating from an earlier people.

It is probable that the fauna, as well as the flora, of the interior highlands is quite distinct from that of the coast country, hence the importance of obtaining the fullest possible collections. In the high mountains of the coast there are, we know, a great many species of birds of paradise of very limited distribution, and therefore we have reason to expect that the fauna will be enriched, in particular, by new and interesting species of birds.

Should we succeed in establishing a fixed main camp in the interior, it follows that an increase in the staff would be necessary. A professional botanist, a geologist, and perhaps yet another scientist, might then be conveyed by aëroplane to the new field of research. Testing the machines for safety and navigability and preliminary practice in mapping and cinematographing the ground from an aëroplane would form essential elements in the preparations for this enterprise.

The problem of hangars for the machines is easily solved. A strong tent, pitched in a sheltered spot, is all that is required. At the depot on the coast a shed of corrugated iron could easily be put up.

As regards the carrying of petrol, the supply would naturally have to be directly proportionate to the distances that are to be flown. The subjoined plan shows the central portion of New Guinea with a square inscribed, the sides of which are 300 miles. This figure is intended to give a rough idea of what distances have to be reckoned with. The diagonal of this square is about 425 miles, or from each corner to the intersection about 215

miles. That this distance is well within the radius of action of an aëroplane is evident. With a speed of 60 to 90 miles an hour, it would only be a question of remaining in the air a few hours, above the forests and plateaus of the island. A petrol supply sufficient for a consecutive flight of ten hours can easily be carried.

FIG. 13—Outline of New Guinea showing distances to be covered in exploring the interior.

As vast areas of still unexplored country are to be found within far easier reach than that—as for instance beyond the Nassau Plateau, and several others of the high coastal ranges, in Dutch, as well as in German and British, territory—it is clear that magnificent prospects are here open to whomsoever will be the first to utilize the aërial method of exploration.

THE DEVELOPMENT OF THE APPRECIATION OF MOUNTAIN SCENERY IN MODERN TIMES*

By WALTER WOODBURN HYDE
University of Pennsylvania

In the literature of the Middle Ages we are struck with the same lack of interest in mountains and mountain scenery which is so characteristic of Roman writers. No one seems to have crossed the mountains for any other reason than direst necessity; no poet spoke of them, and if the minnesingers of the twelfth and thirteenth centuries were impressed by the beauty of woodland and field and the songs of birds, they failed to draw inspiration from this side of nature. Even to Dante, the greatest of medieval bards, the mountains were inconceivable except as huge masses of broken stones and crags: their majesty entirely escaped him, and he viewed them as objects of terror only fit to guard the entrance to his innermost hell.[1] The general feeling of awe and disgust with which the Alps were early regarded is seen in a letter of Master John de Bremble, a monk of Christ Church, who in 1188 found himself at the top of the Great St. Bernard Pass; he speaks of "shuddering at the hell of valleys" below him and prays the Lord to restore him to his brethren that he may tell them never to approach "this place of torment."[2]

And yet the Alpine chains were familiar objects to great numbers of travelers bent on missions of religion and healing. At the bases of the great routes across them missionaries built monasteries and churches, and around them villages slowly grew; while in the passes above hospices were founded to receive the crowds of pilgrims from the north and west of Europe[3] who poured across the mountains on their way to Rome. Thus a hospice on the Great St. Bernard has existed since 859, while a monastery stood on the site as early as 812. The date of its refounding by Bernard of Menthon is generally given as 962 or 968, but must have been in the next century.[4] From the Italian side, too, invalids ventured north to seek health in the mineral waters of Switzerland and Germany, like Baden

* In a recent paper (The Ancient Appreciation of Mountain Scenery, *Classical Journ.*, Vol. 11, 1915-16, No. 2, pp. 70-84; abstracted in the July, 1916, *Review*, pp. 64-65) the writer discussed the subject of the Greco-Roman appreciation of mountain scenery. In the present essay the development of esthetic interest in this phase of nature through the Middle Ages and modern times will be traced very briefly.

[1] For Dante's repugnance see Ruskin: Modern Painters, Vol. 3, Ch. 15, §17; Freshfield, Notes on Old Tracts, IV: The Mountains of Dante, *Alpine Journ.*, Vol. 10, 1881, pp. 400-405; Brentari, *Boll. del Club Alpino Italiano*, 1887, No. 54, pp. 12-61.

[2] See Stubbs: Lectures on the Study of Medieval and Modern History, and Francis Gribble: The Early Mountaineers, 1899, p. 4. For a good example of medieval theories of phenomena encountered on mountains, see Sir John Mandeville's account of Mount Athos.

[3] Especially from England, Ireland, and Iceland.

[4] See discussion of Bernard's date by A. Lütolf in *Tübinger Theolog. Quartalschr.*, Vol. 61, 1879, pp. 179-207, who gives 1081 as the date of his death. The monastery, possibly then situated in Bourg St. Pierre, is first mentioned about 812: "monasterium quod est situm in monte Jovis"; see Gremand: Documents relatifs à l'histoire du Valais, Vol. 1, p. 21.

in Aargau. But despite all this, we hear of no mountain ascents for their own sake, nor praise of mountain grandeur, until the poet Petrarch, in 1336, following the classical example of Lucretius, climbed Mont Ventoux near Avignon in Provence. In a letter to a friend the poet says he had long cherished the ambition to ascend this mountain; he magnifies the difficulty of the undertaking—it is only 6,270 feet in height—but the view fills him with noble thoughts.[5] The following year he went to live at Vaucluse and devoted himself to a life of study and communion with nature in its wildest moods, climbing hills and traversing gorges, thus distinguishing himself from all other medieval scholars.

Though Petrarch was the first to break with the usual vague terror inspired by the mountains and the first to record sentiments of admiration, his ascent was preceded by two others. The earliest climb recorded in modern mountaineering history seems to have been that of the Roche Melon (Monte de Roccia Melone, 11,600 feet) near Susa in Savoy. The knight Bonifacio Rotario d'Asti is said to have founded a chapel on its top in 1358 and to have placed within it a bronze statue of the Virgin (now in the cathedral church of Susa); but there is a description of an earlier attempted ascent recorded by an anonymous chronicler of the monastery of Novalesa, written in the first half of the eleventh century and based on an account given to the chronicler by an old man who had tried to reach the summit.[6] The mountain, "arx Romulea," was supposed to have been the treasure home of a wicked King Romulus and to have been infested with wild beasts. In June, 1588, the Seigneur de Villamont visited the chapel with two guides, and his account is the earliest detailed one of any important Alpine climb.[7] The other ascent mentioned was that of the Pic Canigou in the Pyrenees by King Peter III of Aragon (1236–1285);[8] he found a lake at the top which was the home of a monstrous dragon. It will be seen from these accounts that the people of the Middle Ages not only had physical difficulties to overcome in climbing mountains, but those of a mental sort as well, for they believed that mountain regions were haunted by winged dragons, gnomes, goblins, and all kinds of evil spirits.

Between the date of Petrarch's ascent and the sixteenth century several mountain climbs are recorded. Thus towards the end of the fifteenth century the artist and scientist, Leonardo da Vinci, ascended Monboso, as is attested by fragmentary passages in his "Literary Works."[9] Monboso

[5] See his account of the ascent on June 26th in a Latin letter (De rebus familiaribus, Lib. IV, Ep. I) translated by Henry Reeve in his "Life of Petrarch" (Blackwood's Foreign Classics for English Readers); the original letter is given by Gribble, *op. cit.*, App. D, pp. 264-270, and Reeve's translation, *ibid.*, pp. 18-24.

[6] See Gribble, *op. cit.*, App. A, pp. 257-258, for the chronicle and his translation on pp. 5-7.

[7] See Gribble, *op. cit.*, App. B, pp. 259-261, and translation, *ibid.*, pp. 7-10; the Englishman Thos. Coryate, in his "Crudities Hastily Gobbled Up," 1611, also described it in the early seventeenth century. Murray's "Guide to Switzerland" gives an account of the ascent of the Knight d'Asti.

[8] See chronicle of Fra Salimbene of Parma in Gribble, *op. cit.*, App. C, pp. 262-263, and translation, *ibid.*, pp. 15-17.

[9] Edited from original manuscripts by J. P. Richter, 1883; see especially note 1060; also part of a letter in Gribble, *op. cit.*, App. E, p. 271, translated by Mrs. R. C. Bell, *ibid.*, pp. 25-26.

has been identified by some with Mt. Monbego, 9,326 feet high, in the Maritime Alps; by others with Monte Rosa.[10] In June, 1492, Charles VIII of France, while passing through Dauphiné, was impressed with the rocky Mt. Aiguille near Grenoble (about 7,000 feet), and ordered his chamberlain De Baupré to ascend it; the latter deposited three crosses on the top, heard mass, and remained there about a week. This ascent is attested by a grave deposition of a special commissioner, now in the archives of Grenoble,[11] which is the first detailed account of an ascent still considered difficult. In the New World, it is believed that Diego de Ordaz was the first European to ascend the volcano Popocatepetl in Mexico (17,850 feet); the only proof, however, is a letter to the King of Spain written by Cortez, in which he says he sent a party of Spaniards in 1519 to the top of a "burning mountain" to get sulphur for making gunpowder. In 1522 Francisco Montaño lowered himself into the crater 450 feet—an undertaking now commonly performed by Indian sulphur miners by means of rope-ladders.[12]

It is not, however, until the sixteenth century that we first find indications that the old aversion had begun to yield to a scientific curiosity and admiration. This interest, culminating in the modern romantic sentiment, was of very slow growth and did not burst forth all at once in Savoy a hundred and fifty years ago, as is so generally assumed.[13] It seems to have

[10] So Richter, *op. cit.*, and G. Uzielli: "Leonardo da Vinci e le Alpe," *Boll. del Club Alpino Italiano*, Vol. 23, 1890, No. 56; the latter shows that the name Monbosa existed on maps of Monte Rosa as late as 1740 and that a spur of the mountain is still called Monte Bo; he is followed by Douglas Freshfield in his review of Uzielli's article, *Proc. Royal Geogr. Soc.*, Vol. 14, 1892, pp. 345-347, who there recanted his earlier view that it was Monte Viso (*ibid.*, June, 1884); Freshfield believes the painter reached the Col d'Ollen, 10,000 feet. Coolidge: Swiss Travel and Swiss Guide Books, 1889, p. 163, believes the peak in question is the Monbego (9,326 feet), in the Maritime Alps.

[11] See Gribble, *op. cit.*, App. F, p. 272 *seqq.* and translation, *ibid.*, p. 29 *seqq.*

[12] See Encyclopaedia Britannica, 11th edit., 1910-1911, article Popocatepetl; cf. also A. Lunn: The Exploration of the Alps, 1914, Ch. 2, p. 30; he wrongly gives the date of ascent as 1521.

[13] On the growth of interest in the Swiss Alps see the following works:

G. E. von Haller. Bibliothek der Schweizer-Geschichte, Berne, 1785. [For bibliographical details, see Vol. 1.]

B. Studer: Geschichte der physischen Geographie der Schweiz bis 1815, Zurich, 1863. [A marvelous storehouse of facts.]

G. Studer: Ueber Eis und Schnee, Berne, 1869-83. [Contains the best bibliography of Alpine literature.]

J. Frey: Die Alpen im Lichte verschiedener Zeitalter, Berlin, 1877 (No. 274 of Virchow and Holtzendorf's Sammlung gemeinverständlicher wissenschaftlicher Vorträge).

E. Osenbrüggen: Die Entwickelungsgeschichte des Schweizreisens (Ch. 1 of Vol. 1 of his "Wanderstudien aus der Schweiz," Schaffhausen, 1867).

L. Friedländer: Ueber die Entstehung und Entwickelung des Gefühls für das Romantische in der Natur, Leipzig, 1873 (reprinted in Vol. 2, pp. 206-259, of his "Darstellungen aus der Sittengeschichte Roms"). [Contains sketchy summaries of the history down to recent times.]

B. Schwarz: Die Erschliessung der Gebirge, Leipzig, 1885. [Traces the development in detail until the ascent of Mont Blanc by De Saussure in 1787.]

G. Peyer: Geschichte des Reisens in der Schweiz, Basel, 1885.

Sir Leslie Stephen: The Playground of Europe, 1871, Chs. 1 and 2.

Wm. Longman: Modern Mountaineering and the History of Alpine Clubs, *Alpine Journ.*, Vol. 8, 1876-78, suppl., p. 39 *seqq.*

W. A. B. Coolidge: Swiss Travel and Swiss Guide Books, 1889. [Important work, already mentioned in footnote 10; frequently used as a source in this part of the present paper.]

W. A. B. Coolidge: The Alps in Nature, 1898. [The best work on all phases of the Alps, sporting, social, political, and historical.]

Francis Gribble: The Early Mountaineers, 1899. [Already mentioned in footnote 2; the most readable book on the pioneers of Alpine travel.]

Francis Gribble: The Story of Alpine Climbing, 1904. [Smaller work.]

Arnold Lunn: The Exploration of the Alps, 1914. (Series: Home University Library.)

G. W. Young: Wind and Hill, 1909. [On the poetry of mountaineering.]

Arnold Lunn: The Englishman in the Alps, 1913. [An anthology. Other Alpine anthologies are E. Baker and F. E. Ross: The Voice of the Mountains, 1905; and H. Spender: In Praise of Switzerland, 1912.]

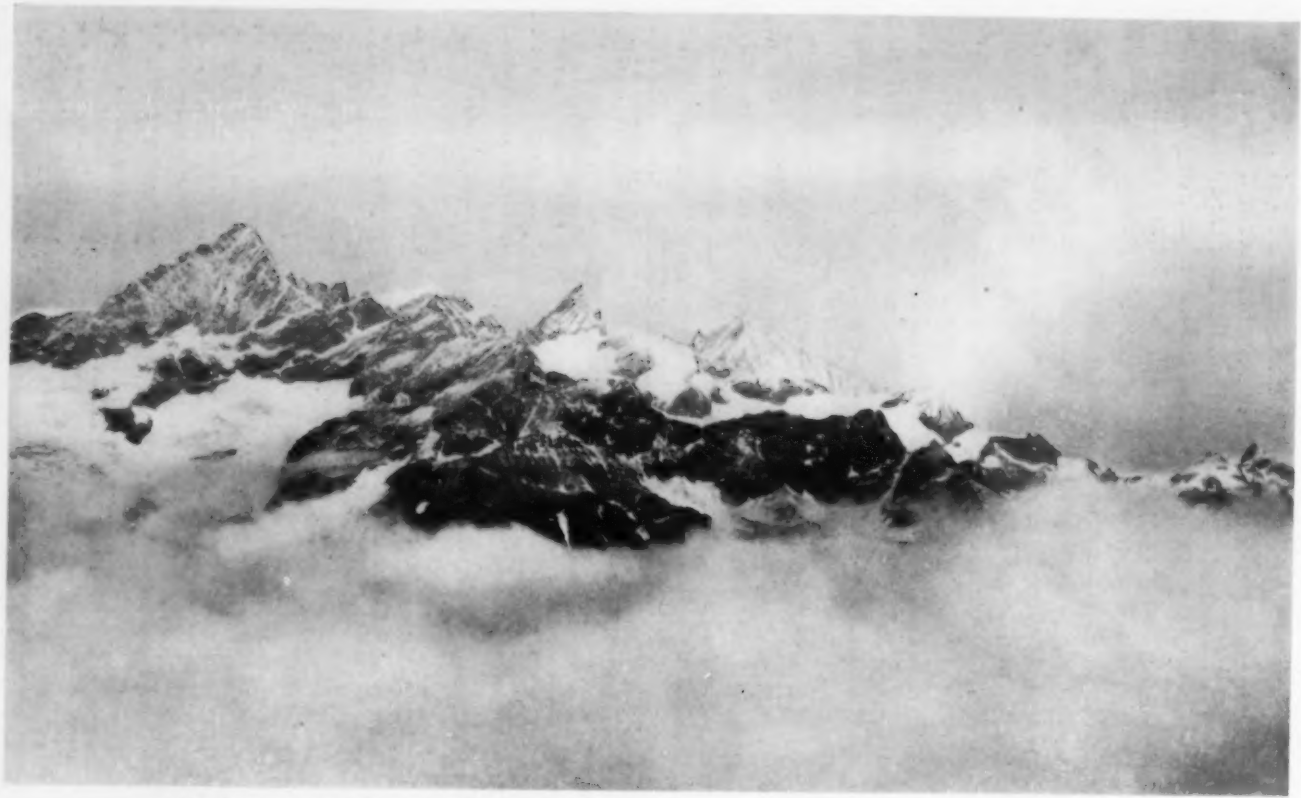

FIG. 1—Peaks of the Pennine Alps from the Matterhorn hut: from left to right, Obergabelhorn, Rothorn, Weisshorn.

FIG. 2—The seven villages on the Italian side of the Great St. Bernard Pass route.

received great impetus at the foundation of the University of Basel in 1460, when, for the first time, men of scientifically trained minds were brought into contact with the mountains of Switzerland. The earliest work dealing with the Alps is, so far as can be learned, a Latin poem composed by Heinrich Moriti, a member of the Basel faculty and the friend of Erasmus. Soon after its appearance in 1514 we meet with ascents. Thus in 1518 a party of four Swiss[14] visited Lucerne and gained permission of the village authorities to climb Mt. Pilatus, a feat which they accomplished without molestation from the restless spirit of the Roman proconsul supposed to dwell in the waters of a marshy lake near the summit. In keeping with the superstitious nature of the age, the story had grown up that the spirit of the suicide Pilate roamed over the earth until a wandering scholar got its consent to remain quietly in the waters of the lake on the mountain which bears his name. Only on Good Fridays could it rise to the surface; at other times it could be aroused by shouting or throwing stones into the lake, when a convulsion of nature would ensue. Finally the government of Lucerne forbade all strangers to approach the lake; in 1307 six clergymen were imprisoned for breaking this rule.[15]

The earliest important ascent, however, seems to have been made in 1536, when Rhellicanus climbed the Stockhorn near Thun (7,195 feet) and celebrated the undertaking in 130 Latin verses.[16] Five years later Konrad Gesner, a professor at Zurich, indicted a letter to Vogel (Avienus) of Glarus, in which for the first time the modern romantic feeling was expressed. As this letter marks the first real break with the older period of fancied terrors[17] and, therefore, a new epoch in the appreciation of the mountains, the following quotation from it is of interest:

> I am resolved, henceforth, most learned Avienus, that as long as it may please God to grant me life, I will ascend several mountains, or at least one, every year, at the season when the flowers are in their glory, partly for the sake of examining them and partly for the sake of good bodily exercise and of mental delight. For how great a pleasure, think you, is it, how great a delight for a man touched as he ought to be, to wonder at the mass of the mountains as one gazes on their vastness, and to lift up one's head, as it were, amongst the clouds. The understanding is deeply moved, I know not wherefore, by their amazing height, and is driven to think of the Great Architect who made them; etc.[18]

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[14] The party included Vadianus—Joachim von Watt (1484-1551)—of St. Gallen; later in the same year, Duke Ulrich of Würtemberg repeated the ascent. The account of Vadianus is presented in Gesner's tractate, mentioned in footnote 18.

[15] Cf. Coolidge, *op. cit.*, 1889, pp. 11-12; Gribble, *op. cit.*, 1899, p. 45.

[16] J. Müller, professor of "bonarum litterarum" at Berne (in Latin called Rhellicanus, after his native village of Rhelliken, near Zurich), published his "Stockhornias" at Basel in 1537 (appended to his Latin translation of Plutarch's "Life of Homer"); all the Latin text and translation by Gribble, *op. cit.*, 1899. App. G, p. 277 *seqq.* and p. 39 *seqq.*

[17] These terrors for the most part, however, kept up for the next two centuries; the last phase of the older period is marked by the work of G. S. Gruner: Die Eisgebirge des Schweizerlandes, 3 vols., Berne, 1760. A revised edition was published in 2 vols. in 1778 under the title of "Reisen durch die merkwürdigsten Gegenden Helvetiens."

[18] Translated by Coolidge, *op. cit.*, 1889, pp. 12-13. This letter was first published as an introduction to Gesner's tractate "Libellus de lacte, et operibus lactariis, philologus pariter ac medicus," appearing in 1541; later, after ascending Pilatus, in 1555, he included it in his "Descriptio montis Fracti sive montis Pilati"; it was also published at Zurich under the title "Epistola ad Jacobum Avienum de montium admiratione."

But Gesner was not alone in his appreciation of the mountains, as we see from the following quotation from the writings of his friend Marti, professor at Berne:

> These are the mountains which form our pleasure and delight when we gaze at them from the highest parts of our city, and admire their mighty peaks and broken crags that threaten to fall at any moment. Who, then, would not admire, love, willingly visit, explore, and climb places of this sort? I should assuredly call those who are not attracted by them dolts, stupid dull fishes, and slow tortoises. . . . I am never happier than on the mountain crests, and there are no wanderings dearer to me than those on the mountains.[19]

In another passage he says he saw many inscriptions cut into stone by climbers on top of the Stockhorn; one in Greek read "The love of the mountains is best."[20]

A similar change in feeling can be traced in contemporaneous art. The medieval painters, like the poets, felt no attraction for mountain scenery. In early Swiss views the spectator almost invariably has his back to the mountains. Dürer and his pupil Altdorfer were the first to show the change in their pictures, and so may be looked upon as the originators of modern landscape painting.[21]

The next important date in tracing the development of the *passion des montagnes* is 1574, the year in which Josias Simler of Zurich published a great commentary on the Alps,[22] in which he gave a detailed description of the Alpine regions and devoted a chapter to the dangers and difficulties of climbing. He gives good advice to the climber, mentioning stocks, ropes, snow-shoes, crampons, and even tobogganing and glissading. He touches on the dangers of crossing snowfields and crevasses, and even mentions the use of black spectacles, "vitrea conspicilia," and burnt cork as a protection against the rays of the sun. In the preface he gives his point of view in the following passage:

> The poets figured that the mountains were haunted by many divine beings—Pan, satyrs, fauns, and oreads; Parnassus, Helicon, with many other summits, were sacred to the gods. Doubtless the ancients wished to shadow forth by these fables the works and might of nature, most discernible in the mountains. By us, meanwhile, who cannot explain these riddles, nor indeed greatly desire to do so, it must nevertheless be confessed that lofty mountains are most worthy of deep study. For everywhere you turn, they present to every sense a multitude of objects to excite and delight the mind. They offer problems to our intellect; they amaze our souls. They remind us of the infinite variety of creation, and offer an unequaled field for the observation of the processes of nature.

From this we see that, whereas Gesner was the pioneer of the emotional

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[19] Quoted by Lunn, from Freshfield's translation, *op. cit.*, 1914, pp. 36-37.

[20] Lunn, *op. cit.*, 1914, p. 16.

[21] Dürer, 1471-1528; Altdorfer, died 1538; they were followed by Wolf Huber and Lautensack; cf. E. W. Bredt: Die Alpen und ihre Maler.

[22] "De Alpibus commentarius"; the edition of 1633 also contains his essay entitled "Valesiae descriptio." Simler makes it clear that the habit of visiting the Alps had become fashionable long before the close of the century: he says foreigners from all parts of Europe came to admire the mountains and explains the lack of interest in them among his countrymen as due to familiarity.

literature on the Alps, Simler was the forerunner of the more objective school; though a climber, he personally displayed comparatively little love or enthusiasm for the mountains.

A very similar sentiment is the following expressed by a traveler a few years later:

> What, I pray you, is more pleasant, more delectable and more acceptable unto a man than to behold the height of hilles, as it were the very Atlantes of heaven? to admire Hercules his pillers? to see the mountaines Taurus and Caucasus? to view the hill Olympus, the seat of Jupiter? to pass over the Alpes that were broken by Annibal's Vinegar? to climb up the Appenine promontory of Italy? from the hill Ida to behold the rising of the Sunne before the Sunne appears? to visit Pernassus and Helicon, the most celebrated seates of the Muses? Neither indeed is there any hill or hillocke, which doth not containe in it the most sweete memory of worthy matters.[23]

Toward the middle of the seventeenth century the topography of Switzerland was accurately studied by Matthäus Merian and Martin Zeiller.[24] The chief merit of their published work was the seventy-five copperplate views of Swiss towns and castles. Near the end of the century a real guide book of the Alps was issued by the Zurich naturalist Wagner.[25] By the beginning of the eighteenth century Alpine literature was enriched by the labors of J. J. Scheuchzer, a professor at Zurich. In his great work he catalogues in Latin and German all the ranges, peaks, glaciers, passes, villages, and even pasture lands known to him, and supplements this with a mass of information which forms a summary of all that was so far known about the Alps.[26] But he manifested neither the sentimental love of the mountains which we see in Gesner nor the scientific interest of Simler. He must have been a poor mountaineer withal, for in one place he says: "anhelosae quidem sunt scansiones montium," and he failed even to reach the top of Pilatus because of "weariness." Moreover he was a firm believer in the notion already mentioned that dragons inhabited the mountains.

However, by this time only a few passes, as the Gemmi and Grimsel, were well known, and only a few of the lower summits, as Pilatus and the Stockhorn, had been reached. Not until the early eighteenth century did tourists from outside Switzerland visit the Alps in great numbers. Most of them, to be sure, were quite content to view the majesty of the glaciers and peaks from the towns at their bases.[27] But a general awakening to the glory of the higher summits began to be felt toward the middle of the cen-

[23] In T. Coryate's "Crudities," 1611, already mentioned in footnote 7; quoted by Lunn, *op. cit.*, 1914, p. 15.

[24] "Topographia Helvetiae, Rhaetiae, et Valesiae," Frankfurt, 1642. The text was written by Zeiller and the views were engraved by Merian. Between 1642 and 1688 Merian and his sons issued thirty volumes on the topography of Switzerland; see Coolidge, *op. cit.*, 1889, pp. 20-21.

[25] "Index memorabilium Helvetiae," 1684; a second edition called "Mercurius Helveticus" appeared in 1688.

[26] "Die Beschreibung der Naturgeschichte des Schweizerlandes," Zurich, 1706-08; more fully in his collected works, Leyden, 1723. He published the first accurate map of Switzerland.

[27] Thus we hear of Englishmen being conveyed by carriage from the Channel to Switzerland in sixteen days for twenty guineas.

FIG. 3.

FIG. 4.

FIG. 3—St. Rhémy, on the Italian side of the Great St. Bernard Pass route. The village is protected by woods against avalanches. Along the slope on the left ran the old Roman road, parts of which can still be seen.

FIG. 4—Looking down the Bernina Pass route between La Rösa and Poschiavo.

tury. The earliest recorded snow peak to be ascended was the Titlis, reached in 1739 by a monk of Engelberg.[28] The huge glaciers of Mont Blanc—or Mont Maudit, as it was then called—ever visible from the streets of Geneva sixty miles away, were visited in 1741 by two Englishmen, Pococke and Windham, who may be regarded as the forerunners of the stream of British tourists.[29] The account of the visit of these "discoverers" of Chamonix is ludicrous in the extreme, but gives us an idea of a Swiss mountain village of that day. They entered Chamonix accompanied by a retinue of porters and guides, who were well armed against the "bandits" of the valley, whom they feared so much that they would not enter any house, but bivouacked in the open air.[30]

In 1760 De Saussure, then a young professor at the newly founded Academy in Geneva, visited Chamonix with the express intention of ascending Mont Blanc for scientific purposes. The next year he came again and offered a prize to the man who would find a route to the top. For a quarter of a century various attempts were made to win it, but not until 1786 was a path discovered by the peasant Jacques Balmat, accompanied by Paccard, the village doctor.[31] Scientific interest was the cause of most of the succeeding climbs until past the middle of the nineteenth century. To this category belong the ascent of the Jungfrau in 1811; of the Finsteraarhorn in 1812; of Monte Rosa in 1855; of the Dom in 1858; of the Aletschhorn in 1859; of the Weisshorn and Schreckhorn in 1861; of the Dent Blanche in 1862; and of the Grandes Jorasses and Aiguille Verte (both in the Mont Blanc massif) in 1865, the same year in which the Gabelhorn and Matterhorn were ascended in the Zermatt region. In 1854 an Englishman named Wills made the hazardous climb of the Wetterhorn from the Grindelwald

[28] The next two were the Buet (10,290 feet) near Chamonix, ascended in 1770 by the brothers Deluc, and the Velan (12,353 feet) in 1779 by Murith, the prior of the Great St. Bernard hospice.

In 1777 there appeared in Berne the first special guide-book to Switzerland, Pastor Wyttenbach's "Instruction pour les Voyageurs qui vont voir les Glaciers et les Alpes du Canton de Berne," in French and German; a second edition, enlarged to forty pages, appeared in 1787. Heidegger's "Handbuch für Reisende durch die Schweiz" appeared at Zurich in 1787-89 and was followed by two other editions, 1790-91 and 1797. It remained the chief Swiss guide-book until the work of Ebel, with which it was incorporated in 1818; for an account of several minor guides appearing between Heidegger's and Ebel's, see Coolidge, *op. cit.*, 1889, p. 37 *seqq.* Ebel's "Anleitung auf die nützlichste und genussvollste Art die Schweiz zu bereisen" appeared at Zurich, 1793, and remained the standard guide until the days of Murray.

[29] Of course Chamonix had been known to the monks of the Benedictine priory there since the thirteenth century. The first authentic date in the history of the valley is 1091, when Aymon, Count of Geneva, bestowed on the Benedictine monastery of St. Michel de la Cluse, near Turin, the "campus munitus."

[30] Cf. Edward Whymper: Guide to Chamonix and the Range of Mont Blanc, 15th edition, 1910, Ch. 1.

[31] As Mont Blanc was the first Swiss district to be minutely explored, the first special guide-book was written about it: "Itinéraire de la vallée de Chamonix," by J. P. Berthout van Berchem, Lausanne, 1790. The artist Bourrit, who had made many attempts to scale Mont Blanc before Balmat's success, wrote an "Itinéraire de Genève, Lausanne et Chamouny," 1791.

As against the story of the ignominious part played by Dr. Paccard in the first ascent of the mountain as promulgated long ago by Dumas in his "Impressions de Voyage," see the true account by H. Dübi: Paccard wider Balmat, oder die Entwickelung einer Legende, Berne, 1913, which is based on the notes of an eyewitness (Baron von Gersdorf) which have recently been discovered in the public library of Görlitz. In the writer's "The Ascent of Mont Blanc," *Natl. Geogr. Mag.*, Vol. 24, 1913, pp. 861-942, the legendary account was followed. For a summary of Dr. Dübi's arguments, see review of his book by Douglas Freshfield in the *Alpine Journ.*, Vol. 27, 1913, pp. 202-209.

side, and so this date is generally taken as the beginning of the passion for mountaineering as a form of healthy and manly sport. Since then it has taken on great dimensions, until now practically every cliff and crag in the Alps has been repeatedly ascended.

Nor should we, in conclusion, overlook the literary influences which, in the eighteenth century, contributed largely to the growth of the romantic sentiment about mountains. The poem by the Swiss physiologist Albrecht von Haller, entitled "Die Alpen" (Berne, 1732), is perhaps the earliest work of this character in the century. But the greatest influence was that exerted by the epoch-making writings of Rousseau, who proclaimed the romantic view of nature in all its phases and especially that of the mountains, which gave a tremendous impetus to the "play-ground" idea of Switzerland. The "Nouvelle Héloïse"[32] is the main exponent of the increasing love of the mountains. In his "Confessions"[33] occurs the well-known passage in which he avows his repugnance to the plains and celebrates the beauty of torrents, rocks, woods, rugged paths, and precipices. The English poet Gray, on the strength of many passages in his letters from the Lake District in 1769, has wrongly been given the honor of having been the first to arouse interest in mountains and mountaineering. Years before (in August, 1741) he had written in the Album of the brothers at the Grande Chartreuse the beautiful Alcaic lines beginning

O Tu, severi Religio loci

in which he first revealed his passion for "niveas rupes" and "fera juga"—

Clivosque praeruptos, sonantes
Inter aquas nemorumque noctem.

He marks the transition from the artificiality of Pope and his followers to the revival in English letters inaugurated by Cowper, Burns, and other poets, toward the end of the century. He shares with Thomson the honor of restoring English poetry to nature. Born and bred within sight of the Cheviot and Lammermuir hills, Thomson was inspired by their rugged scenery, though his musings

On rocks and hills and towers and wandering streams

were at best those of one who still looked upon these features as vague, far away, and gloomy. Macpherson, the author of the poems attributed to Ossian[34] so strangely popular in Europe during the eighteenth century,

[32] It appeared in 1759; though the sentiment is diffused throughout the book, the leading passage is in Lettre XXIII, wherein the lover retires to the Valais and reflects on his impressions of the mountains and climbing.

[33] The "Confessions," though written from 1766 on, were first published in 1782, four years after the philosopher's death. The famous passage is at the end of Bk. IV: "Au reste, on sait déjà ce que j'entends par un beau pays. Jamais pays de plaine, quelque beau qu'il fût, ne parut tel a mes yeux. Il me faut des torrents, des rochers, des sapins, des bois noirs, des montagnes, des chemins raboteux à monter et à descendre, des précipices à mes côtés qui me fassent bien peur."

[34] "Fragments of Ancient Poetry, collected in the Highlands," appeared in 1760; "Fingal, an Epic Poem in six books," appeared in "Poems of Ossian" in 1762, and also "Temora, an Epic Poem in eight books," in 1763.

first revealed the grandeur of his Scotch Highlands, where mountain, glen, and sea were joined: his descriptions of scenery surely quickened the sense of glory as distinct from the horror of mountain scenery. In consequence the Highlands, previously looked upon as the abode of half-savage men, now began to be visited for pleasure.[35]

The initial impulse given by these lovers of nature was increased by the romantic writers of England.[36] These, both poets and prose authors, were at first content to follow the Greek ideal of the delights of more harmonious scenes, but soon felt the influence of the elemental in both sea and mountain. The greatest of them was Wordsworth, the chief interpreter of nature in all literature.[37] He brought to English ears a new message, which had been but faintly heralded by Thomson and Gray. For before his day English poetry had displayed but little serious interest in the delineation of nature, which was still largely impersonal and objective. Where his predecessors had been content to follow the "pathetic fallacy" and read their own feelings into it, Wordsworth let it speak its own message. Not only the outward aspects, but the very soul of nature is revealed in his poetry. His influence, like that of Rousseau, in making it once more subjective and poetic, cannot be overestimated. It is to these two, then, though they were not the first, that we are mostly indebted for our modern sentimental attitude towards nature, especially for our appreciation of the ruggedness of mountain scenery.

[35] The usual repugnance to mountain scenery is well seen in the contemporary dictum of Johnson, who thus wrote of his impressions of Highland scenery, which he viewed in 1773 on his famous journey to the Hebrides:—"It will readily occur that this uniformity of barrenness can afford very little amusement to the traveller; that it is easy to sit at home and conceive rocks, heaths and waterfalls, and that these journeys are useless labors, which neither impregnate the imagination nor inform the understanding" (Journey to the Western Isles of Scotland, 1775—the passage before the description of Glensheals). Similar sentiments were expressed by his friend Richardson, in the description of the crossing of the Mont Cenis pass, in "The History of Sir Charles Grandison," 1753, and also by Goldsmith, who, writing from Holland, spoke with disdain of the Scottish scenery which he had just left.

[36] Roughly from 1800 to 1850 (or better perhaps from the American Revolution to the accession of Victoria in 1837).

[37] In 1797 Wordsworth, his sister Dorothy, and Coleridge retired to the Quantock hills of Somerset with the deliberate intention of making literature "interest mankind permanently," which they believed classic poetry could not do. The result of this purpose was "Lyrical Ballads," appearing in 1798, the spirit of which is best reflected in the two chief poems of the volume, "The Rime of the Ancient Mariner" and "Lines Written a Few Miles Above Tintern Abbey."

A MAP OF THE VEGETATION OF THE UNITED STATES

By FORREST SHREVE
Desert Laboratory of the Carnegie Institution, Tucson, Arizona

[With separate map, Pl. III, facing p. 124.]

The plant life of the United States presents some striking diversities, which are obvious enough to the unlettered man and are fraught with the deepest significance to the geographer, who sees in the dissimilar communities of plants the resultants of an interaction of climate, topography, and soil, and the determinants of many of the primal activities of man. The geographical study of an extensive plant population may be undertaken from either of two points of view, both of which are now rather well known to the scientific public. The older of these is concerned with the distribution of species, genera, and families of plants, as constituting phylogenetic entities or floras, while the later point of view has to do with the distribution of those natural assemblages of plants which are called—both popularly and technically—the vegetation. The phases of plant geography which concern the flora and those which concern the vegetation possess much common ground, but from this they lead into widely separated fields of inquiry. The distribution of the flora is to be explained by paleobotany, geology, paleoclimatology, and the history of evolution, wherever that may be read; the distribution of the vegetation is to be accounted for by the facts of plant physiology, climatology, soil physics, and soil chemistry.

An attempt to secure an accurate map of the vegetation of an area, large or small, may be looked upon as an end in itself, and such a map may well possess a value and usefulness *per se*. The interest of the writer in the compilation of the map which is presented herewith (Pl. III) has been, however, to secure a basal delineation of the geographical features of plant distribution in the United States for use in an investigation of the influence of climate on the range of the principal types of vegetation. For this reason it has been particularly important to base the subdivisions and boundaries of the map upon purely vegetational criteria, with complete disregard of climatic, physiographic, geological, floristic, historical, or other considerations.

The vegetational criteria which it is possible to use at the present time in distinguishing the varied plant communities of a large area are partly features of physiological behavior and partly features of anatomical structure. The former are of fundamental importance because it is through them that plants stand in a relation of adjustment to their environment. The latter are of importance because they are reasonably reliable outward indices of the physiological behavior of plants, which still await investiga-

tion. A great deal is known, for instance, about the physiological importance of the evergreen and deciduous habits in trees, of the microphyllous and succulent forms in desert plants, and of the root distribution and water requirements of perennial grasses and of desert shrubs. We know very little by direct experimentation about the relative water requirements of the dominant trees in the Northern Mesophytic Evergreen Forest, the Northwestern Hygrophytic Evergreen Forest, and the Western Xerophytic Evergreen Forest. We can infer a difference in their water requirements from their size, rate of growth, the anatomy of their leaves, and the character of the plants associated with them in their natural habitats. We know that the rainfall and general moisture conditions are very different in the regions occupied by these three types of forest, but it would be begging the whole question of the relation of climate to vegetation if we were to use the climate itself as a criterion in differentiating the forests. If the forests are not unlike in themselves there is no importance in a study of the climatic differences which accompany them. This is merely one of the cases in which we are thrown back upon general anatomical evidence in distinguishing types of plants on which little physiological work has been done.

The charting of vegetation involves two difficulties at the outset. The first is bound up with the endless diversity of natural plant communities and is concerned with the selection of the units which are to be segregated and delimited. The principal feature of this difficulty lies in deciding how far it may be advisable to subdivide a large group of variable and intergrading entities. The writer has attempted to treat this difficulty in a conservative manner, without hesitating, however, to make departures from the subdivisions that have been used in the few purely vegetational maps of the United States that have been prepared heretofore. Only the largest features of difference between plant communities have been considered, with a desire to segregate the ones that possess marked features of dissimilarity in the gross physiological character of their dominant plants. It is merely by accident that such communities happen to present landscapes of a very different sort, although this is a consideration of some geographical interest. The vegetation recognized for each region is the areally predominant plant-covering of the average upland. The influence of soil character, usually local in its nature, must be ignored in mapping on such a small scale. It is not to be forgotten, however, that the character of the soil may occasionally underlie the predominance of a given type of vegetation over a large area, as is true of much of the Southeastern Mesophytic Evergreen Forest. The so-called climax vegetation is a theoretical concept which can not be applied to all regions and has little relation to the areally predominant vegetation even in regions where it can be demonstrated.

The second difficulty to which allusion was made is regarding the drawing of hard and fast lines between communities which actually intergrade in the most gradual manner. Such gradations are sometimes of so great

an extent as to justify the recognition of transition regions. In all other cases it is necessary to consider the boundary between two communities as being of the same nature as isothermal or isobaric lines—merely connecting all points which possess the same stage in a graduated change.

There is no possible criterion by which it might be maintained or denied that the regions mapped are of correlative value. They must be taken as merely representing the most natural subdivisions of the vegetation from a physiological standpoint.

The sources from which the materials for this map have been gathered are far too numerous for an acknowledgment of them to be made here. The publications of the Forest Service and the Geological Survey, together with numerous papers on the vegetation of states or of smaller areas, have been extensively used. Heavy acknowledgments are also due the many botanical colleagues who have furnished information regarding the regions known to them or have given criticisms on the preliminary drafts of the map.

To those who have a wide familiarity with the vegetation of the United States this map will seem to be of uneven merit, depicting certain regions with greater accuracy and detail than it exhibits in others. This circumstance is partly due to the irregularity with which the vegetation of our country has been studied, and partly to the early disturbance of the virgin forests of the northeastern states, where few records remain as to the distribution of the original types of vegetation. A strong effort has been made to eliminate from consideration all of the changes in our original vegetation which are due to human agency. Such changes have left their mark upon the long-settled portions of the desert areas and the grasslands as well as upon the forests.

The charted areas have been designated by names which primarily describe the character of the vegetation, at the same time that they generally indicate its geographical location. Such names are neither brief nor convenient but their selection has not been made without reasons. From the standpoint of physiological plant geography it is necessary to avoid the names for faunal and floristic zones which are in such common use, but are without logical scientific basis, as "Upper Sonoran," "Arid Transition"; to avoid the use of morphological terms, such as "coniferous"; and to evade the use of designations which imply that a particular factor is responsible for the existence of a given type of vegetation, as "pinelands of the oölitic limestone," or "monsoon forest."

The primary subdivision of the vegetation which has been made is the old one of desert, grassland, and forest—three types involving plants of very dissimilar size, density of stand, anatomical structure, and physiological behavior. The desert area is differentiated by the respective predominance of succulent or of non-succulent plants, and by the nature of the shrubbery which it presents. The grassland has not been subdivided, but solely through a lack of the data necessary to do so. The intensive study of certain grass

areas has shown the diversity of ecological behavior in these outwardly similar plants, but the distribution of the types of grassland—largely local and edaphic—is not well enough known for the purpose of mapping. The forests have been distinguished as deciduous or evergreen, and the latter have been subdivided with respect to their stature, density of stand, foliar characters, and subordinate plants. Transition regions have been recognized between the Deciduous Forest and the northern and southern evergreen areas. Transitions have also been outlined between the Grassland and its adjacent types of vegetation, the Deciduous Forest and the Succulent Desert. In order to simplify the subdivision of the desert as much as possible the Pacific and Texas Semi-Desert areas have not been resolved into their components, and the small areas of encinal in the southwestern border states and the savanna of the Texas coast have been comprised in the Western Xerophytic Evergreen Forest and in the Grassland—Deciduous-Forest Transition respectively.

An inspection of the map shows that the vegetational areas have, in general, a north-and-south trend more commonly than an east-and-west one. This feature suggests that the major differences of vegetation in the United States are determined more largely by moisture conditions than by those of temperature. Such a generalization must, however, be made with caution in view of the fact that the moisture relations of plants have influenced their external form and their foliar characters much more strongly than their temperature relations have done, and that, in the present state of our knowledge, the moisture relations are apt to receive preponderant weight in any attempt to classify vegetation on the basis of its salient physiological features.

Following are very brief characterizations of the eighteen vegetational areas of the United States which have been represented on the accompanying map.

California Microphyll Desert. An extremely low and open stand of microphyllous (small-leaved) shrubs, chiefly evergreen but partly deciduous; very poor in grasses and in succulent plants. The dominant plants are creosote bush (*Covillea tridentata*) and sand bur (*Franseria dumosa*).

Great Basin Microphyll Desert. An open stand of shrubs, sometimes nearly closed; varying from place to place in stature; usually poor in grasses and succulents. The dominant plant is sage brush (*Artemisia tridentata*), locally accompanied by other forms.

Texas Succulent Desert. A mixed stand of microphyllous shrubs and succulent and semi-succulent plants. The shrubs are either evergreen (*Covillea*) or deciduous (*Acacia, Flourensia*). The stem-succulents comprise many species of cacti, chiefly low in growth; the commonest leaf-succulent is lechuguilla (*Agave lechuguilla*); the semi-succulents include sotol (*Dasylirion texanum*), amole, and palmilla (*Yucca*).

Arizona Succulent Desert. A mixed stand of microphyllous shrubs or small trees, either evergreen or deciduous, and of succulent forms, chiefly the stem-succulent cacti. The leading shrubs are creosote bush and cat-claw (*Acacia*); the commonest small trees are palo verde (*Parkinsonia*) and palo fierro (*Olneya*). The succulents comprise large columnar forms (*Carnegiea*), branching arborescent forms (*Opuntia*), and many smaller types.

Texas Semi-Desert (Mesquital-Grassland Complex). An open or closed stand of small trees and shrubs, chiefly deciduous, with local areas of grassland and a representation of succulents. The dominant tree is mesquite (*Prosopis glandulosa*); the principal shrub, huisache (*Acacia farnesiana*).

Pacific Semi-Desert (Encinal-Chaparral-Desert Complex). A region of great topographic diversity in which the vegetation varies locally from encinal (open oak forest, chiefly evergreen), through chaparral (a closed scrub of evergreen shrubs), to desert (ephemeral herbaceous plants, small perennials, local succulents). The principal evergreen oaks are encina (*Quercus agrifolia*), maul oak (*Q. chrysolepis*), and highland oak (*Q. wislizeni*); the principal chaparral plants are chamiso (*Adenostoma fasciculatum*) and species of manzanita (*Arctostaphylos*).

Desert-Grassland Transition. A region intermediate in character between the Grassland and the Succulent Deserts of Texas and Arizona. An open carpet of perennial grasses and ephemeral or root-perennial herbaceous plants, with a more or less sparing representation of succulent and semi-succulent forms. The leading Grassland plants are the gramas (*Bouteloua*) and galleta grass (*Hilaria*), and the chief Desert plants are palmilla, amole, and a small group of cacti.

Grassland. The vast plains area, covered by a more or less closed sod of perennial grasses, becoming more open toward the south and toward the northwest, where the bunch-grasses are predominant. A scattering representation of desert forms is present, particularly in the "bad lands," shrubs are locally present in portions of the area, and the evergreen forests advance from the west onto hills and rocky soil, while the Deciduous Forest encroaches from the east through the valleys of the largest streams. A number of species of herbaceous perennials are found in all parts of the Grassland, being chiefly Composites. The leading grasses are the gramas (*Bouteloua*), buffalo grass (*Bulbilis dactyloides*), and prairie grass (*Koeleria cristata*).

Grassland—Deciduous-Forest Transition. The rather ill-defined belt in which the Deciduous Forest emerges from the flood-plains and river margins and occupies a portion of the upland. On the western edge of the belt there is a high percentage of grassland, while in the eastern portion the deciduous forest becomes nearly continuous. The principal trees of this region are the bur, white, and black oaks (*Quercus macrocarpa, Q. alba, Q.*

velutina); the principal grasses, beard grass (*Andropogon furcatus*), Indian grass (*Sorghastrum nutans*), and dropseed (*Sporobolus cryptandrus*).

Deciduous Forest. The extensive area in the Mississippi valley and southern Appalachians which was formerly occupied by an almost unbroken forest of a score or more of deciduous trees. A few prairies occur in the southern portion of the area, and evergreen needle-leaved trees occupy bluffs and shallow soil in the mountains. The commonest trees are species of oak (*Quercus*), hickory (*Hicoria*), chestnut (*Castanea*), beech (*Fagus*), maple (*Acer*), walnut (*Juglans*), tulip (*Liriodendron*), and ash (*Fraxinus*).

Southeastern Evergreen-Deciduous Transition Forest. The area in which there is a nearly equal commingling of the deciduous and evergreen species of the adjacent regions. Local bodies of purely deciduous or purely evergreen forest are determined by soil conditions. The commonest evergreen trees are the loblolly pine (*Pinus taeda*) and the scrub pine (*P. echinata*), and the commonest deciduous trees are post oak (*Quercus minor*), Spanish oak (*Q. digitata*), and blue jack oak (*Q. brevifolia*).

Southeastern Mesophytic Evergreen Forest. The coastal plain forest of evergreen needle-leaved trees, with a subordinate admixture of evergreen broad-leaved and deciduous species. Extensive areas of this forest are pure stands of long-leaf pine (*Pinus palustris*) or Cuban pine (*P. caribaea*) in open formation, with a clear floor nearly devoid of shrubs and carpeted with grasses and herbaceous plants.

Northeastern Evergreen-Deciduous Transition Forest. A region in which the trees of the Deciduous Forest area and those of the eastern portion of the Northern Mesophytic Evergreen Forest are intermingled in nearly equal proportions. A very common type of forest in this region is that in which maple (*Acer saccharum*), beech (*Fagus atropunicea*), and hemlock (*Tsuga canadensis*) are dominant.

Northern Mesophytic Evergreen Forest. This extensive region is characterized throughout by a pure or nearly pure stand of needle-leaved evergreen trees, among which deciduous trees are often present either as minor components of the forest or else as trees of lower stature. Virgin stands of this forest range from 60 to 125 feet in height and vary from open park-like formations to heavy forest with a completely shaded floor. The heaviest stands are almost devoid of shrubby undergrowth, but the more open ones are accompanied by deciduous shrubs and under-trees. In spite of the essential identity of this forest from the Pacific to the Atlantic it is nevertheless made up of a large number of tree species. Very many extensive areas are formed by a single species and many others by an admixture in which not more than three or four species are involved. In the western half of the area the yellow pine (*Pinus ponderosa*), the lodgepole

VEGETATION AREAS OF THE UNITED STATES

Compiled by FORREST SHREVE

Scale 1: 9,600,000

- California Microphyll Desert
- Great Basin Microphyll Desert
- Texas Succulent Desert
- Arizona Succulent Desert
- Texas Semi-Desert
- Pacific Semi-Desert
- Desert-Grassland Transition
- Grassland
- Grassland—Deciduous-Forest Transition
- Deciduous Forest
- Southeastern Evergreen-Deciduous Transition Forest
- Southeastern Mesophytic Evergreen Forest
- Northeastern Evergreen Deciduous Transition Forest
- Northern Mesophytic Evergreen Forest
- Western Xerophytic Evergreen Forest
- Northwestern Hygrophytic Evergreen Forest
- Alpine Summits
- Swamps and Marshes

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pine (*P. murrayana*), and the red fir (*Pseudotsuga mucronata*) are the trees which dominate the most extensive stands. In the eastern portion of the area the white pine (*P. strobus*), the hemlock (*Tsuga canadensis*), the jack pine (*P. divaricata*), and the balsam fir (*Abies balsamea*) are the most common species.

Western Xerophytic Evergreen Forest. An open forest of low stature, the trees seldom exceeding 40 feet in height. The needle-leaved and scale-leaved evergreens are the dominant trees, but the forest is everywhere accompanied by shrubbery and by some succulent or semi-succulent plants, and is carpeted in many localities by an open growth of perennial grasses. Along the Mexican boundary this forest merges into the encinal, or evergreen oak type. The dominant species of the Xerophytic Evergreen Forest vary from state to state but are in almost all cases either junipers or piñons.

Northwestern Hygrophytic Evergreen Forest. A well-marked type of forest characterized by density of stand and by the size of its trees, which commonly reach 100 to 125 feet in height and are often in excess of this. The floor of the forest is heavily shaded and supports relatively few deciduous under-trees, although there is usually a rich growth of shrubs and of ferns, mosses, and other herbaceous plants. The trees which characterize this area are the red fir (*Pseudotsuga mucronata*), redwood (*Sequoia sempervirens*), black hemlock (*Tsuga mertensiana*), red cedar (*Thuja plicata*), white fir (*Abies grandis*), and others.

Alpine Summits. The portions of the higher mountains which lie above timber line, characterized by a very scant growth of stunted or prostrate trees, by mats of alpine herbaceous plants, or merely by mosses and lichens.

Swamps and Marshes. The swamps are composed of evergreen and deciduous trees in great variety, the bald cypress (*Taxodium distichum*) and tupelo (*Nyssa*) being the commonest forms. The marshes are widely varying areas of grasses, sedges, and emersed aquatic plants.

THE INFLUENCE OF WEATHER ON STREET-CAR TRAFFIC IN DULUTH, MINNESOTA

By EUGENE VAN CLEEF

If street-railway companies could estimate their daily traffic twenty-four to thirty-six hours in advance they could effect a great saving of money for themselves and could give the public improved service. However, a forecast seems impossible when one considers the many different factors likely to influence the traveling public. An analysis of the possible influences shows the weather to be the largest single factor. Yet just how effective it is and the manner in which its changes are reflected in passenger traffic have remained unknown. Through the courtesy of the officials of the street-railway company of Duluth, Minnesota, who have made available

Weather Report and Key to Units Representing Weather Conditions

Time	Temperature		Units	Condition of Atmosphere	Key
	Plus	—			
5 a. m.	48	108	148	Clear	Rain or Snow—0 Plus degrees temperature
12 m.	58	30	88	Cloudy	Cloudy Sky—30 Plus " "
6 p. m.	46	60	106	Partly Cloudy	Part Cloudy Sky—60 Plus " "
12 p. m.	42	0	42	Rain	Clear Sky—100 Plus " "
			384		Total Units for 24 hours ending at midnight.

FIG. 1—Facsimile of blank form used by the street-car company of Duluth, Minn., to record "weather units."

The figures in the second column under "Temperature" are intended to express, not temperature, but the "condition of the atmosphere" according to the key given in the last column. The first figure should read 100.

the requisite data and have very kindly co-operated in this work, it has become possible to compare the variations in passenger traffic in that city with fluctuations in daily weather conditions. Duluth was selected for this study for the following reasons: (1) the number of people who walk to and from work in the mornings and evenings, respectively, is quite large; (2) the number who walk home for lunch and then walk or ride back to their place of business is unusually large; (3) the public as a whole is especially given to long walks, or "hikes"; (4) the love for outdoor life has hardened many people to all varieties of weather; (5) the writer is well acquainted with the community and its peculiarities.

On inquiring at the offices of the street-car company as to its interest in the significance of weather influences upon its traffic, it was learned that it had become concerned in this vital matter many years ago. For twenty years it had kept such a record. Observations for temperature, precipitation, and cloudiness are made by the car-starter located approximately in the center of the city and entered on what are termed "weather unit" blanks, a sample of which is shown in Figure 1. The thermometer used has been of mediocre quality and has not always had the proper

exposure. To the temperature is added a number indicating the condition of the atmosphere in an arbitrary scale ranging from 0 when precipitation occurs to 100 for a clear sky. The total number of units indicates the relative quality of the day: if they are high the day is a good one; if low it is not so good. No absolute standard of reference has been calculated. The figures are compared with a sort of sensible average, dependent upon the season of the year. For example, 384 units, as given in Figure 1, represent a poor April day, whereas 450 units would represent a very fair day for that season. In so far as the scheme takes into account three of the most common elements, temperature, precipitation, and cloudiness, it possesses merit; it lacks, however, the fourth very common factor, the

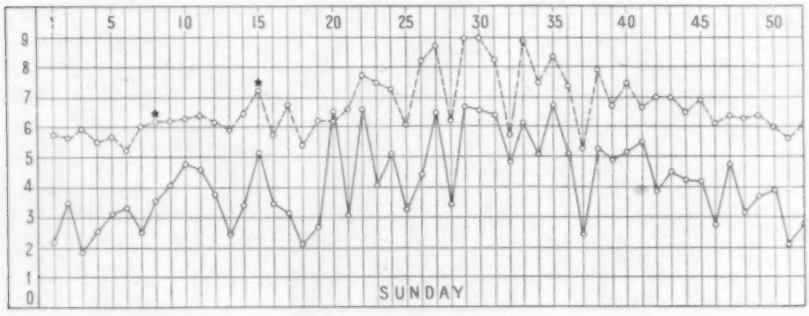

FIG. 2—Diagram showing the relation of street-car traffic to weather in Duluth, Minn., on Sundays during 1914.

The dotted curve represents passengers per mile per day. The continuous curve represents "weather units" as calculated by the street-railway company. The numerals at the top of the vertical lines indicate the number of the week in the year. The figures at the left of the horizontal lines represent the passengers per mile in units and at the same time the "weather units" in hundreds. The stars refer to holidays or other special occasions.

wind. These records are now kept only as tradition. At one time they were observed rather closely in the hope that they might reveal information which would aid the company to run its system more efficiently both for the public and for itself.

To afford a proper basis for this investigation the total number of passengers carried was reduced to terms of the number of passengers carried per mile per day and plotted with the weather units. These data were plotted with reference to the respective days of the week, i. e. all the Sundays of the year were grouped in one curve, the Mondays in another, and so on. It is obvious that to compare a Sunday with a Monday would be illogical, the former a day when most of the business world rests, in contrast with the latter, a day of great activity. It would be just as bad to compare any other two days of the week, since the business world inclines toward the performance of different kinds of business on different days. Figure 2 illustrates the curves for Sunday only. The parallelism of these

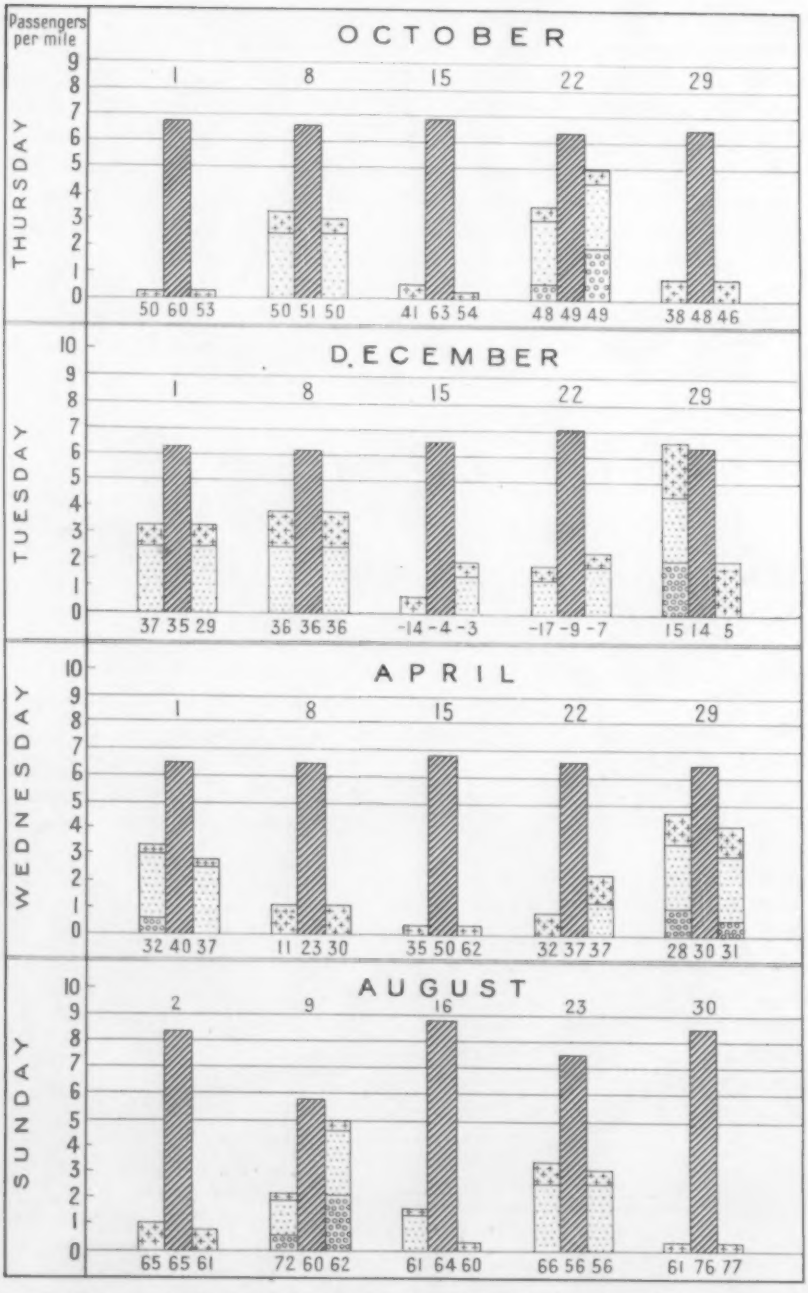

FIG. 3—Diagram showing the relation between the specific weather elements and the street-car traffic in Duluth, Minn., on selected days at different seasons in 1914. (For explanation, see bottom of p. 129.)

curves is striking. (It is similar for the other days of the week, though not quite so emphatic.) Even where the variation in the passenger curve is slight, as at the left of the diagram, its meaning is none the less important. The variation oftentimes represents only one-tenth of a passenger per mile per day. When the average number of miles run per day amounts to 9,539, as it does for Tuesdays, for example, a difference of one-tenth of a passenger per mile means 953.9 passengers per day, and the fare which they pay equals $47.69. This decrease in traffic may be the equivalent of an actual loss to the company. Such a loss occurring on very many days may mount into the thousands of dollars and soon prove serious. Hence the tenths earn a right to as much respect as the whole numbers. Clearly, then, so far as revealed by the curves in Figure 2, weather and traffic are closely related. In very few instances does the parallelism break down. But nothing in these curves indicates what elements exert the greatest influence or whether perhaps all are of equal significance. Hence the problem really begins here.

The year 1914 was selected in this initial effort to solve the problem because it approaches very nearly the ideal. The weather was not unusual; no strikes occurred, and "jitneys" had not yet made their appearance. It seemed at first as though many years of data would be necessary for conclusive evidence; but the results thus far have proved so substantial that one normal year has been accepted as affording a satisfactory basis for work for the present.

How to plot the data for ready comparison presented a small problem in itself. Temperature, precipitation, wind velocity, and cloudiness were the elements chosen as those which probably exert the maximum influence. Humidity would hardly be effective in a region like that of Duluth, where days of great heat combined with high humidity are rare. The combination of high humidity and cold winds, producing "raw" weather, is also uncommon. Sunshine is the complement of cloudiness and therefore appears automatically in the figures for cloudiness. Special phenomena such as thunderstorms, blizzards, and severe rainstorms are not incorporated in the graphs but are accounted for in the detailed weather record from which the figures for the graphs were taken.

The day was divided into morning (A. M.) and afternoon (P. M.), and the average condition for these respective periods was recorded. In the case of temperature the figures were taken at three periods—7 A. M., 12 noon, and 6 P. M., the hours when the traffic is heaviest. In Figure 3

EXPLANATION OF FIG. 3—The heavily shaded central column in each group represents the number of passengers carried per mile according to the scale on the left, on the day indicated by the date above. The outer columns in each group represent, according to their symbols: precipitation (small circles), cloudiness (dots), and wind velocity (crosses), the left-hand column indicating prevailing conditions between 7 A.M. and 12 M, and the right-hand column those between 12 M. and 6 P. M.

The unit of scale for these elements is one-fourth the passenger mile unit on the left of the diagram. One such unit represents one unit in a scale of ten for cloudiness and wind velocity; for precipitation the scale is: trace, 2 units; light, 4; heavy, 8.

The three figures below each group of columns represent the temperature at 7 A. M., 12 M., and 6 P. M., respectively, reading from left to right.

extracts from the original charts are given, to illustrate the scheme for plotting the data. This method brings six items at once before the eye of the reader: the date, passengers per mile per day, temperature, precipitation, winds, and cloudiness. In the original charts the months were grouped as follows: December-January-February, March-April-May, June-July-August, and September-October-November, approximating rather closely to the true seasons in this vicinity. Accordingly seasonal phenomena could be easily observed. The second triad of months can hardly be termed spring in this region. A more proper designation is "transition season," which will be used hereafter. Holidays and other special days[1] were eliminated from consideration, although the influence of the weather even on these occasions is readily detected.

The relation of traffic to weather could be better shown if figures were available for the morning traffic as distinct from that of the afternoon. Again, if the data for the non-working travelers were at hand the problem would be very much simplified. The workers who travel regularly each day represent the constant, the others the variable. But since none of the above data have been compiled or are even possible of compilation one must try to recognize in the figures at hand the resolution of the constant and the variable.

The average of the number of passengers carried per mile per day for the respective days of the week was calculated in order to ascertain the daily variation in traffic for the seasons. The results are given in Table I.

TABLE I—AVERAGE NUMBER OF STREET-CAR PASSENGERS CARRIED IN DULUTH, MINN., PER MILE PER DAY FOR EACH DAY OF THE WEEK AND FOR EACH OF THE FOUR SEASONS, 1914

	DEC.-JAN.-FEB.	MAR.-APR.-MAY	JUNE-JULY-AUG.	SEPT.-OCT.-NOV.
Sunday	5.9	6.2	8.3	6.7
Monday	6.1	6.5	7.0	6.6
Tuesday	6.2	6.5	7.2	6.5
Wednesday	6.2	6.5	7.2	6.6
Thursday	6.3	6.6	7.1	6.7
Friday	6.1	6.5	6.9	6.5
Saturday	6.9	7.4	7.8	7.4

These averages are employed as representative of the normal passenger traffic. For example, 6.2 is taken as the normal number of passengers

[1] January 1 New Year's Day
February 22 Washington's Birthday
March 1 Ski tournament
April 12 Easter Sunday
May 30 Decoration Day
June 11 Animal show
June 24 Swedish carnival
July 4 Independence Day
July 23 Circus
August 13 Grocers' and butchers' picnic
September 6 Labor Day
September 11 Industrial exposition
October 31 Halloween
November 26 Thanksgiving Day
December 25 Christmas Day

carried per mile per day on each of the Sundays during the transition season. Table II illustrates how certain comparisons were made. In the

TABLE II—ILLUSTRATION OF THE METHOD USED TO DETERMINE THE FACTORS WHICH INFLUENCE STREET-CAR TRAFFIC IN DULUTH, MINN.

	+	T	P	W	C	H	P.C.
June 5	—	×	....	×	....	....	6.5
12	—	×	....	....	....	....	6.8
19	—	×	....	×	....	....	6.8
26	—	×	×	×	....	....	6.7
July 3	+	....	×	....	....	×	8.6
10	—	×	....	×	....	....	6.6
17	—	×	....	Calm	....	....	6.8
24	+	×	....	"	....	....	7.2
31	+	×	....	....	....	....	7.3
Aug. 7	+	×	....	....	....	....	7.0
14	+	....	....	×	....	....	7.0
21	+	×	....	....	....	....	7.1
28	—	×	....	×	....	....	6.7
					Average for the season		6.9

Abbreviations—
— Decrease
+ Increase
T—Temperature
P—Precipitation
W—Wind
C—Clouds
H—Holiday
P. C.—Passengers carried per mile

first column opposite the dates is indicated the deviation in the number of passengers from the normal (6.9 for the season) by a minus (—) sign or a plus (+) sign, according to the sense of the deviation. Under the other column headings a cross-mark (×) occurs according as the particular element or elements seemed to be the determining cause of the deviation. Decreases were primarily considered. One must necessarily be more interested in a decrease in passengers, since this means reduced profits. Finally, the crosses in the respective columns were added together. In 118 days when a decrease occurred wind figured 70 times, temperature 56, precipitation 51, and clouds 29. These elements played a part either independently or in combination. From these results it would appear that wind is the most influential factor. During this period there occurred a total decrease in traffic of 33.3 passengers per mile or .28 passenger per mile per day. If the average daily mileage is 9,546.7 (this figure excludes Sundays, for which the mileage averages 9,043.4), then the total reduction in receipts per day amounts to $133.65, or, for 118 days, $15,770.70, surely an amount worth trying to save.

An analytical study of the statistics and charts develops five well-defined conditions which may cause a decrease in traffic. (The references to Figure 3 are meant only to illustrate and not to prove the assertions.)

(1) Precipitation is practically always effective excepting when it occurs in the form of a light snow unaccompanied by wind. Light snow in itself seems to have little influence. In Figure 3 compare October 22 with October 8, days differing essentially only in their precipitation.

(2) Precipitation accompanied by a strong wind is more effective than if accompanied by a weak wind.

(3) Other elements being the same or very similar, a considerable drop in temperature will reduce traffic.

(4) Even when other elements are dissimilar, a decided drop in temperature reduces traffic that would otherwise assume normal proportions or even rise above the normal. In Figure 3 compare April 8 and 22. They differ primarily in temperature.

(5) A moderate to strong wind, usually 4 or above (Beaufort scale), reduces the number of passengers. In Figure 3 compare December 1 and 8. The drop in patronage can be only accounted for on the basis of wind.

Cloudiness has a slight tendency to decrease traffic. The evidence, however, is not fully convincing. Fogs, as one would expect, cause a reduction. Heavy storms, either of snow or sleet, or thunderstorms are reflected in the passenger returns.

The various factors assume the following order (the most effective first) with respect to their capacity for reducing traffic:

(1) Precipitation accompanied by wind;

(2) Precipitation alone, except light snow;

(3) A considerable drop in temperature accompanied by a moderate to strong wind;

(4) A strong wind—most effective when in combination;

(5) A decided drop in temperature regardless of other elements.

A few apparent anomalies occur. In one instance a high wind accompanying low temperature seemed to be the cause of an increase in traffic. On another occasion a heavily drifting snow failed to produce a decrease in patronage; and in three other cases a high wind accompanying a moderately high temperature increased traffic. A possible explanation of the last situation may be that the warmth of the day lured people out of doors who subsequently were driven to the cars by the unpleasantly high wind. Furthermore, the department stores report that, in the event of a three-day storm, their receipts go up on the third day, in spite of unfavorable weather. People become tired of remaining indoors so long and venture forth in spite of the weather. These anomalies are cited to indicate some of the complications that arise when one endeavors to formulate a rigid rule with regard to weather influences.

If the five weather factors given above are correct they should prove up in a traffic forecast. One hundred such forecasts were made covering the period from March 23 to July 12, 1914, inclusive.[2] The street-railway company considers an estimate involving an error of not more than 3.3 per cent as practically exact. If the error is not more than 5 per cent, the estimate is still very good. The average deviation of the forecasts from the average daily traffic was 2,155, or within 3.2 per cent of the correct figure. This error falls well within the limits set by the company. But since averages so often cover up a great many details of importance, certain absolute figures are presented.

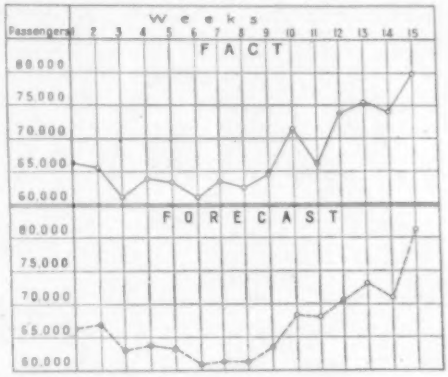

FIG. 4—Diagram showing the agreement between the forecast and the actual figures of street-car traffic in Duluth, Minn., for a period of 15 weeks from March 23 to July 12, 1914.

The smallest error for any given day was 33 on a day when 67,147 passengers were carried, and the largest error was 8,918 when 80,235 passengers were carried. On the latter day a convention of uncertain attendance led to an estimate far too low. The following tabulation gives the percentage of the total number of forecasts for which the error ranged between zero and a specified maximum:

0 to 2500.....64%	0 to 4000.....82%
0 " 3000.....68"	0 " 4500.....87"
0 " 3500.....80"	0 " 5000.....91"

The average daily traffic for the period was 67,548. Using 5 per cent as the maximum error which may enter into the forecast without seriously diminishing its value, the efficiency percentage reaches 79; in other words, in 79 cases out of 100 the error falls under 5 per cent. If an error of 15 per cent in weather forecasts is recognized as permissible, an error admitted by the U. S. Weather Bureau, then the efficiency of the traffic forecasts becomes evident.

The latter half of the forecast period was disturbed by the appearance of the "jitney" after its winter hibernation, by the uncertainty of enforcement of a threatened ordinance regulating it, and by the opening of an extension of the street-railway lines. In spite of these disturbances the average of accuracy was maintained. The influences that produce variations in the traffic returns are many. Yet none seem so powerful as the

[2] This period includes 112 days. The weather map was not available on 12 days, hence no forecast was attempted.

weather. The curves in Figure 4 indicate how well the variations in the forecast agree with the facts.

The investigation was started with a hope merely to demonstrate positively that weather influences passenger traffic to a degree greater than most persons are aware and to make some exact determinations of the character of that influence. It was hardly expected that the results would lead to the ability to forecast traffic. The case is only one of many in the domain of climatology which convince one that the time must come when direct application of the knowledge of the weather influences upon man's daily activities will constitute the normal method of procedure.

IS THE ATLANTIC COAST SINKING?

By DOUGLAS W. JOHNSON

More than half a century ago Professor George H. Cook, then state geologist of New Jersey, presented striking and apparently convincing evidence that the Atlantic coast of North America was gradually subsiding at the rate of two feet per century. Farm lands under cultivation fifty years before were, at the time of his investigation, covered with salt marsh grasses; old corduroy roads were encountered several feet below the surfaces of salt marshes at many points along the shore; and, within the memory of men then living, the ocean waters had risen so high upon the wheels of tidal mills that their operation had become difficult or impossible. The scientific manner in which Professor Cook presented his arguments gained for him not only the respect of geologists in all parts of the world but a very general acceptance of his interesting conclusions.

Independent investigation of the shores of England, southern Scandinavia, the Netherlands, and France convinced many geologists in those countries that the Atlantic coast of Europe was suffering a subsidence similar to that of the North American coast. On both sides of the North Atlantic, therefore, there has long existed a conviction that the land is slowly but surely sinking beneath the ocean waters. In America in particular it has been accepted as a well-established fact that a subsidence of from one to two feet per century is still in progress.

On various occasions the writer has discussed the supposed evidences of recent coastal subsidence along the Atlantic coast of the United States and southeastern Canada, and has presented reasons for believing that the so-called proofs of land sinking within historic times were open to alternative explanations, whereas the physiographic evidence could only be explained by postulating long-continued coastal stability. Studies on the eastern and southeastern coasts of England, the coast of Holland, and the coast of southern Sweden indicated that in like manner the supposed proofs of recent subsidence in those regions were open to criticism, while the physiography of the English and Swedish coasts furnished convincing evidence that the relative level of land and sea had not changed appreciably for many hundreds of years. A careful study of numerous reports by French observers detailing the evidence of a recent progressive subsidence of the western coast of France led to the conclusion that this evidence was not of such a character as to establish the subsidence theory; but the writer made no personal examination of this coast.

The apparent evidences of subsidence are so striking, and the conclusions in favor of recent coastal stability, in the localities in question, are so radically opposed to the long-held opinions of most geologists and geog-

raphers, that it will be profitable to review briefly some of the latest contributions to this interesting problem. We may mention first some foreign studies and then return to investigations of our own coast.

Professor Jules Welsch of the University of Poitiers has recently applied to the study of the western coast of France the same methods of interpretation outlined in the writer's "Fixité de la côte Atlantique de l'Amérique du Nord"[1] and has published his conclusions in a paper entitled "Fixité de la côte du Centre-Ouest de la France."[2] This clearly written and well-illustrated report analyzes at length the supposed proofs of recent subsidence upon which earlier investigators have placed reliance, criticizes other evidence which led certain students to infer a recent elevation of the land, and finally presents physiographic evidence of long-continued coastal stability. His conclusion is expressed in the words, "There is no proof of a submergence or an emergence of the coast since the Neolithic epoch, that is to say, during the last few thousand years."

In a paper on "Den Formodede Littorina-Saenkning i Norge"[3] Professor Hans Reusch discusses supposed proofs of a late post-glacial subsidence of Norway, particularly of the southern part of the coast. The evidence is largely in the form of submerged peat deposits, such as have frequently been cited by American students as indicating recent subsidence of our own coast. Professor Reusch shows that in each case the field relations are easily susceptible of an alternative explanation.

The Report of Progress of the Ordnance Survey of Great Britain, detailing operations up to March 31, 1916, contains results of precise leveling which are pertinent to the present discussion. I quote the following from the section on geodesy: "In the year 1837-38 a line of accurate leveling was executed by Mr. Bunt, in order to compare the mean sea-level of the Bristol Channel with that of the English Channel, and also to enable subsequent leveling to determine whether there had been any vertical movements of the land surface. . . . . In the year under review, 78 years after the original operation, the line was very carefully releveled. . . . . The difference between the two results for the length of 58.87 miles between Perry Farm and Axmouth is 1.12 inches. . . . . The probable error of the new geodetic leveling from Perry Farm to Axmouth, as calculated from the discrepancies between fore and back leveling, is 0.17 inch. The probable error of Doctor Whewell's leveling of the same line, calculated in the same way, works out at 1.88 inches. . . . . The chief result of the comparison is that there is no indication that there has been any change in the relative levels of the coast lines of the Bristol Channel and English Channel during the 78 years that have elapsed since Doctor Whewell's leveling was carried out."

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[1] *Annal. de Géogr.*, Vol. 21, 1912, pp. 193-212.

[2] *Annal. de Géogr.*, Vol. 23, 1914, pp. 193-218.

[3] *Norges Geol. Undersök. Aarbok*, 1915, Art. 4, 19 pp.

In the Summary Report of the Geological Survey of Canada for the year 1914, published in 1916, there is a synopsis of the results secured by Professor J. W. Goldthwait in his physiographic work in Nova Scotia. From this it appears that Professor Goldthwait examined the old fortress at Louisburg, the position of which is so often asserted to prove a recent sinking of the land. The present writer had previously secured a report upon this locality through an assistant, Dr. Donald Barton, who was unable to find any evidence of a change of level in the vicinity of the fort. Professor Goldthwait reaches the conclusion that "there has been no sinking or rising of the coast at this place during the last two centuries."

Dr. D. S. McIntosh, professor of geology in Dalhousie University, Halifax, has just published an interesting article entitled "A Study of the Cow Bay Beaches."[4] A number of drumlins near Halifax have been eroded by the sea, and with portions of the erosion products the waves have constructed a series of beach ridges. Examination of the rings of growth of stumps on the oldest ridge fixes its minimum age at about 150 years. Inasmuch as the crest of the oldest beach ridge has about the same altitude as that of the modern ridge, the author concludes that "these beaches are the effect of waves upon a stationary coast—one which has remained so for at least a hundred and fifty years."

A paper by Dr. J. W. Spencer on "Postglacial Earth-Movements about Lake Ontario and the Saint Lawrence River"[5] contains a section on the "present stability of the lake region," in which occurs a table of the mean differences of level between two permanent benchmarks at Port Colborne and Cleveland, 160 miles apart, as deduced from the daily records of lake-level for a period of 57 years. Such a table is of interest because of the possibility, or even probability, that any subsidence or elevation of the land would be accompanied by a warping which would be revealed by a change in the relative levels of two points so far apart. No such change is apparent. Doctor Spencer concludes: "From a full study it is apparent that there has been no change of level in 57 years. . . . . These results disprove my original suggestion (1894) that the Niagara discharge would be turned into the Mississippi in the not distant future. This idea was expanded into a monograph on earth-movements by Dr. G. K. Gilbert, who used the fluctuations of the lakes; but in so doing he took the levels of a few isolated days, irregularly selected. The erroneous results derived therefrom have been widely quoted, but the table given above contains the proof of the present stability of the lake region."

In connection with his study of the New Jersey coast, the present writer desired to ascertain whether there had been any warping or tilting of the state, such as might be expected to accompany the rapid subsidence generally believed to be in progress all along the New Jersey shores. He accord-

[4] *Trans. Nova Scotian Inst. of Sci.*, Vol. 14, 1916, Part I. pp. 109-119.
[5] *Bull. Geol. Soc. of Amer.*, Vol. 24, 1913, pp. 217-228.

ingly suggested to the state geologist the desirability of re-surveying certain lines of precise level in the southern part of the state, where the supposed evidence of subsidence was most striking, in order to determine whether the relative elevations of Atlantic City, Vineland, and Cape May Court House, three points of a triangle 30 miles on a side, had undergone any change since the important surveys of 1886. The leveling was done in 1911, and the results published the following year.[6] In the accompanying table the essential facts are made clear:

	Elevations in feet above sea-level		
Place	*1886*	*1911*	*Difference*
Cape May Court House.....	19.498	(19.498)	0.0
Vineland.....	108.100	108.082	—0.018
Atlantic City.....	8.954	8.931	—0.023

The agreement between the levels of 1886 and those of 1911 is extremely close and is well within the limits of the probable error of the observations. It is clear, therefore, that there has been no warping or tilting in the southern New Jersey region during the last quarter of a century.

Similar lines of level were run in the northern part of New Jersey in 1915, and the results are summarized in the Annual Report of the State Geologist, published the following year. The important conclusion so far as the present discussion is concerned occurs in the statement: "During the period of about 30 years intervening between the several series of levels, there has been no appreciable change in relative elevations at the seashore and in Sussex and Warren Counties (points from 40 to 50 miles apart), due to tilting of the earth's crust."

Special importance attaches to the results of precise leveling prosecuted under the direction of the Chief Engineer of the City of New York in recent years, because the results obtained enable one to determine not only whether there has been any warping or tilting of the land in the vicinity of New York, but also, with equal certainty, whether or not the land mass as a whole has subsided. The data summarized below are taken from the report on "Precise Leveling in New York City," by Frederick W. Koop, published in 1915.

In 1887 a bench-mark on a monument at Perth Amboy was found to be 18.5763 meters above mean sea-level at Sandy Hook, and in that same year a bench-mark on a sea wall at Willets Point, 33 miles distant to the northeast, was determined as 4.3083 meters above the same datum plane. In 1911 Mr. Koop connected these points by a line of precise levels which showed that the relative positions of the two bench-marks had changed by an apparent amount of but 1.2 millimeters, or .004 feet. The slight apparent difference is less than the probable error of the earlier survey and proves that on a line 33 miles long no warping or tilting has occurred in the last quarter of a century.

Absolute elevation or subsidence of the land would be detected by com-

[6] Report on Leveling. *Geol. Survey of New Jersey Bull. 6*, pp. 18-21, 1912.

paring the absolute elevations of certain bench-marks in 1887 with the absolute elevations of those same bench-marks in 1911. It is not possible to make such comparisons with sea-level at the same point, because the tide gage at Sandy Hook, which furnished the datum plane in 1887, is no longer operating; while the tide gage at Fort Hamilton, which has been used to determine the modern datum plane, was not operating in 1887. Careful studies have, however, convinced Mr. Koop that mean sea-level has the same elevation both at Sandy Hook and Fort Hamilton, so that comparison between the two surveys can be made with accurate results. The following table gives the apparent differences in elevation of certain bench-marks after a lapse of 24 years, together with the differences which ought to exist if the land had been sinking at the rate of 1 foot or 2 feet per century, as commonly supposed. All differences are expressed in millimeters.

Bench-mark at	*Apparent difference in 24 years*	*Expectable difference, assuming 1 foot subsidence per century*	*Expectable difference, assuming 2 feet subsidence per century*
	mm.	*mm.*	*mm.*
Bay Ridge, Brooklyn	−0.5		
Bath Beach, Brooklyn	−1.2		
East 84th Street, Manhattan	−0.7	73.0	146.0
Willets Point, Long Island	−1.2		
College Point, Long Island	+3.7		

When one considers that the probable error in determining mean sea-level at Sandy Hook was ±9.1 millimeters, it is seen that all the apparent differences are well within the limits of error of observation; whereas the expectable differences according to the subsidence theory are so great that no errors of observation could obscure the subsidence, were it really in progress.

If the reader will pardon the personal reference, I will quote Mr. Koop's final conclusions verbatim: "From the determinations above noted, which are the result of spirit leveling of unquestioned accuracy, it is clear that from the standpoint of the geodesist or engineer there is no reliable evidence to show a general progressive subsidence of the Atlantic coast in New York City and vicinity. On the contrary, all the evidence is in favor of stability. . . . . The work of the writer on the Board of Estimate leveling must be construed as a striking confirmation of Professor Johnson's theory of coastal stability as set forth in the preceding paragraphs. It is of especial interest because it is a proof based on engineering methods of the absolute stability during the last quarter of a century of the very part of the coast which is generally supposed to be undergoing most rapid subsidence at the present time."

THE NEW YORK MEETING OF THE ASSOCIATION OF AMERICAN GEOGRAPHERS

The thirteenth annual meeting of the Association of American Geographers was held in New York, December 28-30, 1916, in connection with the sixty-ninth meeting of the American Association for the Advancement of Science. In spite of the attraction of the larger meeting, the interest in the geographical papers was so great that the majority of the members remained in attendance throughout the sessions of the smaller body.

Some thirty papers were read. As the titles and abstracts will ultimately appear in the *Annals of the Association of American Geographers* only a brief general discussion will be given here.

There were several papers belonging to the domain of mathematical geography and more especially of cartography. Mr. William Bowie of the U. S. Coast and Geodetic Survey described the operations of that bureau to determine the intensity of gravity throughout the United States. Since 1909 the network of stations has been greatly increased, namely from 47 to 260. Professor J. Paul Goode presented a suggestion to diminish the marginal distortion prevalent in Mollweide's Projection by interrupting its elliptical shape and projecting each continent on a new central meridian. Mr. Godfrey L. Cabot of the Aëro Club of New England, who spoke on invitation, called attention to the need of maps for aviators in this country and outlined what had been done in this field abroad. He referred to the final selection by experts in Europe of the scale of 1:200,000, or about three miles to the inch, as the best suited to aëronautical purposes. On invitation, Professor Boris P. Weinberg of the Technological Institute of Tomsk, Siberia, spoke on the method of centers. He based his remarks on a paper he had recently published in the *Izvestiya of the Imperial Russian Geographical Society* (Vól. 51, 1915). After alluding to the well-known use of the method by the Bureau of the Census for the determination of centers of area and population, he exhibited a map showing his own determinations of the movement of the center of population and area of the Russion Empire from 1613 to 1913 and compared them with Mendeleyeff's earlier calculations of a similar nature.

Some ten papers were devoted to physiography. A notable feature of this part of the program was a group of papers dealing with the extinct lakes of the Great Basin region. Each of the five speakers (Messrs. E. E. Free, J. C. Merriam, Ellsworth Huntington, D. T. MacDougal, and J. C. Jones) presented a distinct line of evidence bearing upon the origin and age of various lake phenomena in the Southwest. Because of various pieces of evidence, among which are the salt deposits, practically all of which are within 150 feet of the surface, Mr. Free's conclusions agree with those of Professor Jones, that the lakes fully occupied their respective basins in recent times and became extinct within historic times. Doctor Huntington likewise concludes that there have been marked variations of climate during the past few thousand years. He believes that the rise and fall of the water can be correlated with the more rapid and less rapid growth of the big trees as shown by their rings of growth. On the other hand Professor Merriam can not accept the paleontologic evidences of the extreme modernity of the strand lines. The facts on which the discussion was based will be published in a group of five papers to appear in an early number of the *Review*.

Professor R. S. Holway of the University of California read a paper on the marine terraces of California. The illustrations were striking. The evidence of warping of relatively recent upraised marine benches along anticlinal and synclinal lines was especially noteworthy. Professor George D. Hubbard of Oberlin College gave a brief description of the moraines, eskers, and kames found in 1916 in the southern Green

Mountains near Wilmington, Vermont, which seem to point to the existence of local glaciation after the withdrawal of the continental glacier. Dr. R. F. Griggs of Ohio State University described his recent visit to the scene of the great eruption in 1912 of Mt. Katmai at the base of the Alaska Peninsula. The volcano blew its head off in the great explosion, leaving a caldera three miles long and nearly half a mile deep. On the Bering Sea side of the range a great transverse valley was found where for miles the ground is full of fissures from which steam issues in thousands of jets.

Three papers dealt with the physical geography of foreign areas. Professor Emmanuel de Martonne of the Sorbonne, visiting French professor at Columbia University, read a paper on the physiography of the Carpathian Mountains, conceived to extend from the Danube at Vienna to the Danube at the Iron Gates, i. e. including the section generally known as the Transylvanian Alps. The salient points of his paper are contained in an article which will be published in a forthcoming number of the *Review*. Professor W. H. Hobbs of the University of Michigan discussed sand blast erosion and deflation in the shaping of the oases of the Libyan Desert. He called attention to the fact, also referred to by Professor Jefferson in his article on Utah in the May, 1916, number of the *Review* (pp. 347-349), that many oases are great flat-floored and steep-rimmed depressions in the desert and not merely spots where water occurs and vegetation flourishes. He also pointed out the necessity for bearing in mind the mechanism of erosion in arid regions in any general scheme of erosional processes, as we tend to be unduly influenced by the evidence of erosion in humid regions, with which we are more familiar. Tahiti and its coral reefs were the subject of a paper by Professor W. M. Davis of Harvard University. The spurs of the two volcanoes which form the island are truncated in maturely aligned sea cliffs. The island is surrounded by a barrier reef. The sea cliffs must have been cut under conditions which prevented the formation of reefs, and since then new conditions must have been introduced as a result of which the growth of reefs has been possible. The cause of the change from the condition of cliff cutting to those of reef growth is found in a moderate submergence of the island.

Three papers dealt with aspects of American climatology. Professor R. DeC. Ward of Harvard University discussed the rainfall types of the United States. Fourteen types were distinguished, and each was illustrated by a composite curve of the monthly rainfall amounts. A map showed the areal distribution of these types. Professor A. J. Henry of the U. S. Weather Bureau spoke on the flood-producing rains of 1916 in the United States. The torrential rains in southern California, in Arkansas, Missouri, and the lower Ohio valley were described, as well as the two tropical storms which visited the East Gulf and South Atlantic States in July. Dr. C. F. Brooks of Yale University dealt with the snowfall of New England. The amount of snowfall in any given section is dependent on its exposure to the snow-bearing winds, northeast from the Atlantic for the greater part of the region and westerly from the Great Lakes in the northern part. The highlands are the snowiest because they are cold, moist, and windy; the intermontane valleys have less snowfall because of the higher temperature, smaller precipitation, and less exposure. In the coastal region, since the other conditions are favorable, the snowfall depends on the temperatures. The two last-named papers will appear in forthcoming numbers of the *Review*.

Plant geography was represented by three papers. Messrs. H. L. Shantz and Raphael Zon of the Forest Service submitted in manuscript their new map of the vegetation of the United States. This map will form a plate in the atlas of American agriculture in preparation by the U. S. Department of Agriculture. The authors discussed the principle of classification used, Mr. Shantz having compiled the non-forested and Mr. Zon the forested areas. In another paper, Dr. R. M. Harper discussed the past, present, and future of the forests of the eastern United States. In the last two hundred years the forest area east of the Great Plains, originally occupying seven-eighths of that territory, has been reduced about 40 per cent and the total stand of timber about 60 per cent.

The predictions of the early exhaustion of the forests, the author said, had nearly always turned out to be exaggerated. The influences tending to preserve the trees seem at present to be nearly equal to the destructive influences. A paper on plant succession after glacial recession mainly in Glacier Bay, southeastern Alaska, was read by Mr. W. S. Cooper. Glacier Bay is especially favorable for such study because of the rapid recession which has taken place there during the last century and a quarter, a movement which has been accurately determined several times during recent years.

In the domain of human geography, one of the most interesting features of the program was a symposium on the geography of the war conducted by Professor D. W. Johnson of Columbia University on the evening of December 29. Professor Johnson himself contributed an introduction to the subject. He was followed by a number of speakers who discussed various aspects of the war on land, on water, and in the air, as follows: S. W. Cushing, The Plains of Northern France; Lawrence Martin, Rivers and Marshes of the Eastern Front; Ellsworth Huntington, The Danube Valley and the Balkan Complex; Emmanuel de Martonne, The Carpathian Mountains and Transylvanian Alps; J. Paul Goode, Geographic Aspects of the War on Water; R. DeC. Ward, Geographic Aspects of the War in the Air; J. Russell Smith, Economic Geography of the War. The papers all brought out the fact, referred to in his introduction by Professor Johnson, that, in spite of the remarkable development in means of transportation and the general machinery of war, geographical conditions still have a dominant influence in warfare.

General anthropogeography was represented by a paper by Professor R. H. Whitbeck of the University of Wisconsin on the influence of geographic environment on primitive religions. He pointed out how the environment of each was reflected in the mythology and religious beliefs of the Norseman, the Mohammedan, the American Indian, and the ancient Egyptian, and alluded to the gradual making-over of the mythology of the early Aryan invaders of India after they had come under the influence of the monsoon climate, so different from that of their arid Bactrian home. The decreasing influence of environment as the scale of civilization rises was also referred to, and to this circumstance was ascribed in part the absence of a marked geographic influence in the mythology of Greece and Rome, and in part to the absence of a dominant geographic fact such as the Nile in Egypt, the desert in Arabia, or the monsoon in India. A local example of the influence of nature on man in India was afforded by Mr. S. W. Cushing's paper on Sriharikota, a long narrow sandy island off the Coromandel Coast north of Madras, and its primitive inhabitants, the Yānādis.

American topics in anthropogeography were variously represented. Professor Mark Jefferson in his presidential address pointed out how the distribution of cities reflected the broader economic divisions of the United States. He displayed a striking map showing, by different symbols, the location and size of all cities from 1,000 inhabitants up. Similar maps were exhibited for the British Isles and India. These two afforded a graphic contrast between an industrial and an agricultural population. A related topic was treated by Mr. Lawrence V. Roth of Harvard University in a paper on geographic and historic factors in the growth of the more important American cities. The movement of population towards the larger cities in the United States falls into four periods, each introducing a new geographic area. The first period begins with our Colonial history, and the development of cities takes place along the Atlantic coastal plain; during the second era, beginning about 1810, city growth is most notable in the Mississippi valley along the river fronts; beginning about 1850 a third era opens, and the cities of the Great Lakes district have a notable growth; during the fourth period, opening about 1900, a relatively sudden movement of population is found on the Pacific coast. Professor Collier Cobb of the University of North Carolina read an interesting paper on colonial transportation in North Carolina, pointing out how in many cases the roads of the time have become the present routes of the trunk-line railroads.

In the field of commercial geography, Mr. A. E. Parkins of the Peabody College for Teachers at Nashville, Tenn., discussed the development of manufactures at Detroit. An interesting point brought out was that the present characteristic industry of the city, the manufacture of automobiles, cannot be ascribed to geographic influence. It is rather due to the inertia of an industry whose origin there was more or less arbitrary. Examples of this kind are worth noting as a warning against laying undue stress on the potency of geographic influence, especially as regards economic phenomena, which are often purely man-made. Mr. W. G. Reed of the U. S. Department of Agriculture spoke on "Plimsoll's Mark," the load-line painted on the vessels of the leading sea-faring nations. The various positions prescribed for placing this mark according to the different oceans and the different seasons reflect the recognition of climatic influences in this domain of commerce.

The meetings were held in the rooms of the Department of Geology at Columbia University. Some forty members of the Association attended, and the general attendance of members and non-members was between forty and eighty. In another building an exhibit of recent maps, particularly of the European war, had been arranged by Columbia University and the American Geographical Society. A relief model, with no vertical exaggeration, of the Mt. Washington Range in the White Mountains was also exhibited by Professor J. W. Goldthwait of Dartmouth College, on which the cirques he has called attention to in recent papers were clearly discernible. At a business meeting Professor W. M. Davis introduced the suggestion that the Asssociation appoint a committee to co-operate with the National Research Council, and after consideration the Council recommended the following two resolutions, which were adopted at the business meeting of December 30, 1916:

Resolved: That the Association of American Geographers endorse the plan of the National Research Council presented to the Association by Professor Davis and promise co-operation.

Resolved: That the Council be authorized to designate representatives from among the members of the Association of American Geographers as members of a co-operating Committee.

The Council thereupon authorized the retiring president, the president-elect, and the secretary-elect (Messrs. Jefferson, Ward, and Dodge) to appoint from among the members of the Association a committee to co-operate with the National Research Council.

Luncheon, served in the geological laboratory, and dinner, provided at a long-table at the headquarters hotel of the Association, afforded opportunities for social intercourse. The meeting closed with the reading and adoption by unanimous vote of a resolution of thanks for the hospitality extended to the Association by Columbia University.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Annual Reports of the Society; Meetings of January. The annual meeting of the American Geographical Society was held on Tuesday evening, January 23, at the Engineering Societies' Building, 29 West Thirty-ninth Street. President Greenough presided. The annual reports of the Council, of the Treasurer, and of the Special Committee were read, as follows:

Report of the Council

January 18, 1917.

To the Fellows of the American Geographical Society:

In presenting a report of activities for the past year the Council is gratified to be able to record that the Society is in all its departments more prosperous than at any time in its history. Its membership has received a very notable increase owing to accessions to Fellowship from all over the country, including amongst the number many individuals distinguished in private and public life. This marked development is particularly pleasing as evidence that the work of the Society is worth doing and that it is being well done. The most important divisions of this work may be described as (1) the *Geographical Review*, (2) special publications, (3) lectures, and (4) the library, through one or all of which the Society comes in contact with the public and with its Fellows.

The *Geographical Review*, the monthly publication of the Society, aims to inform its readers of the chief developments throughout the world relating to geographical science. It likewise attempts by its reviews to give an adequate summary of principal works in the field to which it is devoted, and to embody in each number one or two more popular essays by eminent writers and geographers. The Society has received abundant and gratifying evidence that the *Geographical Review* has met an important need on the part of scholars and teachers throughout the country, to reach whom is one of the important functions of the organization. The black-and-white maps illustrating every number and the colored maps, like those published in November and December, have been the most notable single improvement in the publication. The response on the part of our readers has been gratifying and we have received the highest commendation for the excellence of the maps, the originality of treatment they displayed, and the evidence they give of important geographical research.

In carrying out its educational aims the Society has sought the advice of teachers of geography and especially those in the public schools of New York. Already a committee of organization has been appointed by the twenty-five teachers who, with the Acting Superintendent of Schools, met at the Society's building in December to discuss ways and means for promoting co-operation and for putting at the disposal of educational agencies the vast stores of book and map material the Society has been gathering for years. From time to time this committee will make recommendations which it is hoped will have far-reaching importance in improving geographical education not only in New York but throughout the country.

In line with this action is the interest of the American Geographical Society in aiding the work of the National Council of Geography Teachers. The aims of this new organization are praiseworthy and its field of service so broad that every encouragement should be given it.

The Society has begun the publication, through Henry Holt and Company, of special books that are commanding wide attention. It is planned to have them written in a style that will appeal to the general reader, and at the same time to the explorer, traveler, and professional geographer. Every book will be a real contribution to the modern science of geography. The series will include reprints of geographical classics, and also first printings of explorers' journals and rare manuscripts, as well as works of original scholarship. The series will consist of at least one volume a year, the first volume having appeared in December, 1916. They will be distributed without charge to all members indicating a desire to receive them. One of the most striking features of these books will be the excellence of the illustrations. The best drafting skill will be combined with superior engraving to produce authoritative maps. Moreover, the maps will be distinctive and will represent discoveries in the fields of exploration and research.

The first book of the series is "The Andes of Southern Peru," by Dr. Isaiah Bowman, Director of the Society. It is an interpretation of human life and character in some of the most famous regions of South America made during an expedition of which he was geographer. The book is illustrated by nearly one hundred photographs and over one hundred maps, sketches, and diagrams. Among the illustrations are some very striking photographs of country hitherto unknown to geographical science and seven topographic maps in color, the result of a survey of over two hundred miles across the lofty snow-capped Maritime Cordillera of Peru.

The lectures have been arranged bi-monthly during the winter season to include addresses by eminent speakers upon subjects attracting popular interest. The attendance at the lectures is necessarily confined for the most part to a New York City community, but they attracted a constant and liberal attendance. The lecturers for the past season comprise the following: Frederick I. Monsen, Samuel Alden Perrine, James Barnes, Frederic Poole, Leo Wiener, B. R. Baumgardt, John Paul Goode, Harriet Chalmers Adams (April 25 and November 21, 1916), Charles Wellington Furlong, and Arthur Stanley Riggs.

Additions to the library during the past year comprise 1,881 books and pamphlets, 4,448 periodicals, 40 atlases, and 2,826 sheet maps. The Society aspires to maintain a collection devoted to geographical research which shall be equal to any in the country and to this end it is believed each year makes distinct progress.

The number of Fellows at the date of this report is 2,787, showing an increase during the year of 1,636. The number of Life Fellows is 373.

The David Livingstone Gold Medal, founded by the Hispanic Society of America, was awarded by the American Geographical Society to Sir Douglas Mawson in recognition of his distinguished labors in connection with the Australasian Antarctic Expedition.

The Association of American Geographers met in joint session with our Society during two days, April 14 and 15, 1916. The gathering was attended by a very large number of the leading geographers of the country, and the papers and proceedings were of permanent value. The *Annals* of the Association, which are printed and distributed by our Society, command an increased circulation and esteem among scientists.

The report of the Treasurer of the Society for the year accompanies this report and shows current revenues and expenditures. Various special donations have been received from friends of the Society which have enabled it to add to the permanent value of its work. The Society's collection of maps and documents of contemporary interest have been open to the public each day of the year with the exception of three principal holidays and have been made use of very largely by visitors and students.

The members of the staff have been efficient and zealous and have responded willingly to the somewhat increased labors caused by the enlargement of the Society's publications and the increase in its membership.

Respectfully submitted on behalf of the Council

John Greenough
Chairman

REPORT OF THE TREASURER FOR 1916

On January 1, 1916, there was on hand in general account		$1,257.43	
Unexpended donations		2,369.59	$3,627.02
During the year there have been received from fellowship dues, sales of publications, interest on investments, and donations applied to general purposes		$42,605.22	
Donations for special purposes		12,888.30	
Mortgages paid off	$13,600		
Less reinvested	13,000	600.00	
Dues for 1917 paid in advance		13,780.00	69,873.52
			$73,500.54
There have been expended for salaries, meetings, purchase of books and maps, library, publications, house expenses, insurance, postage, etc.		$42,609.87	
Special donations expended		12,864.76	55,474.63
Balance on hand, December 31, 1916	in general account	$15,032.78	
	special donations	2,393.13	$18,025.91
	uninvested funds	600.00	

Henry Parish, Jr.
Treasurer

REPORT OF THE SPECIAL COMMITTEE

New York, January 18, 1917.

The Special Committee appointed December 21, 1916, to nominate and invite suitable persons to fill vacancies in the offices of the Society existing at the date of its annual meeting in January, 1917, respectfully report that they recommend the election of the following gentlemen to the offices designated:

		TERM TO EXPIRE IN
President	John Greenough	1918
Vice-President	Paul Tuckerman	1920
Domestic Corresponding Secretary	Archibald D. Russell	1920
Treasurer	Henry Parish, Jr.	1918
Councilors	Charles H. Tweed	1920
	Madison Grant	1920
	Grenville Kane	1920
	Allison V. Armour	1920
	Hamilton Rice	1920

Hamilton Fish Kean
Archer M. Huntington } *Committee*
Chandler Robbins

The reports of the Council and the Treasurer were approved and ordered on file. The persons recommended by the Special Committee for the offices to be filled received the unanimous vote of the Society and were declared duly elected.

President Greenough thereupon submitted for confirmation the names of 104 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society.

The lecture for the evening was entitled "Recent Explorations in Northern Brazil" by Dr. William Curtis Farabee of the University of Pennsylvania Museum. Doctor Farabee is a real "wilderness explorer," to use Colonel Roosevelt's phrase. In the past ten years there have been but two or three others who have done equally extensive and original work in the Amazon basin. Doctor Farabee's description of new tribes hitherto wholly unknown to white men were of absorbing interest, and scarcely less interesting were his photographs and accounts of the physical features of the region back of the Guianas which he was the first to explore. A note on his expedition will be found below under "South America." The published account of his work should be of great value to geographical science, and it is a source of satisfaction that the *Review* is soon to have a paper on some of the results of this noteworthy expedition.

At an extra inter-monthly meeting on January 9, Dr. Eric Mjöberg of Stockholm addressed the Society on "Exploration in Northern Queensland." Doctor Mjöberg described the results of his recent expedition to this tropical part of Australia, an occasion which provided the incentive and at the same time the experience for his proposed expedition to New Guinea, outlined in the first pages of this number of the *Review*. Doctor Mjöberg's lecture was in part illustrated by some remarkable moving pictures of the natives of Australia.

Appointment of an Assistant Librarian. Mr. George M. McBride has been appointed Assistant Librarian on the staff of the American Geographical Society and will begin his duties on July 1, 1917. Mr. McBride was for several years Director of the American Institute at La Paz, Bolivia. His interests are mainly in the field of South American geography.

NORTH AMERICA

Industrial Invasion of the Kentucky Mountains. At last modern industrialism threatens to penetrate the fastnesses of the Kentucky Mountains. Since the days of a thriving trade in salt and iron and of through traffic between the Blue Grass country and Ohio and the Atlantic seaboard this wild mountain region has preserved its early characteristics in a very complete isolation from the rest of the world. In 1910 the population of the 35 mountain counties, totaling over 560,000, included less than one-half of one per cent foreign-born. Most of the small number of foreigners were skilled miners, foreign farmers being practically unknown. Now, attracted thither chiefly by lumber and coal, outside capital is coming into the district and bringing south-European labor in its train. The insignificant urban population is growing. Jenkins, at the foot of the "Trail of the Lonesome Pine," shows the spectacular growth that in its day

marked the rise of Gary, Indiana. But the native population, the independent land-owning farmers, do not adapt readily to these changing conditions. Some retreat still nearer the headwaters of the streams; many who remain are degraded in the competition for which they are ill prepared. A restriction of the rapid exploitation is strongly urged (B. H. Schockel: Changing Conditions in the Kentucky Mountains, *Scientific Monthly*, August, 1916).

Settlement of the Boundary Dispute between Ohio and Michigan. In 1787, Congress passed an ordinance which freed the Northwest Territory from the claims of the Eastern States. A curious mistake arose, however, through ignorance of the geography of the territory adjoining the southern waters of the Great Lakes. The maps of 1787 showed Lake Michigan north of its real location with reference to Lake Erie, so that when the framers of the Ordinance of 1787 decided on establishing a boundary which would run in an east-and-west line from the southern end of Lake Michigan to the shores of Lake Erie, they were presumably under the impression that the line would leave to Ohio Territory Maumee Bay with the settlement and port that later became the city of Toledo. (The text of the boundary ordinance may be found in Henry Gannett's "The Boundaries of the United States," etc., 3rd edit., *U. S. Geol. Survey Bull. 226*, 1904). In 1802, however, suspicion regarding exact conditions was awakened when the constitution of the state of Ohio was being framed, and a proviso was added to the new constitution whereby the northern state boundary was to be run in a direct line from the northernmost cape of Maumee Bay. This proviso satisfied the people of Ohio, but in Michigan Territory the inhabitants insisted on adherence to the original text of the Ordinance of 1787. The ensuing controversy was not settled until 1915, when a joint boundary commission was appointed for the purpose of undertaking a permanent delimitation.

An article in *Engineering News* for December 28, 1916 (pp. 1234-1235), enumerates the various surveys and gives details as to the methods of procedure used. The first survey of the disputed territory had been made in 1817. Resurveys were undertaken in 1837 and 1842. A reconnaisance of the line in the summer of 1915 showed that none of the monuments erected in the course of the early surveys existed. Nevertheless it was decided to relocate the line as originally staked out on the ground rather than to run a straight line from end to end. Existing features such as fences and highways were accepted when agreed to by landowners on both sides as being the state line. In addition the notes of the three earlier surveys were available, and points were located with reference to the nearest section and quarter-section corners as given in these notes. The final boundary line has now been permanently marked by a line of granite monuments. The completion of the surveys was celebrated under the auspices of the Toledo Engineering Society on November 24, 1915.

Reclamation Work in Central Florida. Construction work is about to begin on the drainage of the upper St. John's valley, central Florida (*Bull. Atlantic Deeper Waterways Assoc.*, Oct., 1916). The area covered by the scheme embraces about 265,000 acres of overflow lands now unavailable for agriculture. According to the accepted project natural drainage lines will be reversed, three main canals being cut to the salt waters of Indian River, the lagoon back of Cape Canaveral. With subsidiary canals there will thus be created 250 miles of inland waterways. Completion of the work, said to be the largest undertaking of its kind in the South, is anticipated in about two years.

A New Railroad through the Coast Range in Oregon. The Willamette Pacific Railroad, a line built through the Coast Range in Oregon from the Willamette Valley to the Pacific Ocean, was opened to traffic for its entire length in August, 1916 (W. P. Hardesty, *Engin. News*, Jan. 11, 1917). The road is 121.6 miles long and connects Eugene, on the main line of the Southern Pacific Railway between San Francisco and Portland, with Marshfield on Coos Bay. This makes it the sixth transverse railroad leading from the Willamette-Puget Sound depression to the ocean other than the two that follow the natural break of the Columbia River through the barrier of the Coast Range. The ocean terminals of these six railroads from north to south are: Marshfield, Yaquina, and Tillamook, Ore., and South Bend, Aberdeen, and Hoquiam, Wash., the last two on Gray's Harbor.

The new road runs nearly west from Eugene for about 70 miles until the coast region is reached, first piercing the backbone of the range in a tunnel 2,489 feet long and 579 feet above sea level at its western end and then following the valley of the Siuslaw River. From here the road turns south and parallels the coast 3 to 6 miles inland along a string of fresh-water lakes until Marshfield is reached. Marshfield, which

lies on the southern side of Coos Bay, is reached over a steel bridge almost a mile in length.

Besides stimulating the development of the district it traverses, the new line will afford the coal of the Coos Bay region a rail outlet to market.

The Local Name of Lassen Peak. In the December, 1916, *Review* (pp. 464-465) a note appeared stating that the correct name of the volcano in the Cascade Range whose recent return to activity has brought it into prominence was Lassen Peak. This was based, as there indicated, on a decision of the U. S. Geographic Board and a short article in *U. S. Geological Survey Press Bulletin No. 294*. With reference to the note in the *Review* the Society has received from one of its Fellows, Mr. Andrew H. Palmer of San Francisco, an interesting communication concerning the local usage of the name. On a trip last year he had occasion to visit towns on all sides of the mountain and made it a point to interview the people of the neighborhood. All told he spoke with about one hundred persons. Invariably, he writes, the person interviewed referred to the mountain as "Mount Lassen" and not as "Lassen Peak." The following incident, writes Mr. Palmer, is significant. "One day last May, while traveling by automobile stage from Weaverville to Redding, I asked the chauffeur if that was 'Lassen Peak' off on the eastern horizon.' 'No,' said he, 'that is Mount Lassen.' He was perfectly serious and had never before heard of 'Lassen Peak.'" The fact that the newspaper despatches generally use the form "Mount Lassen" also reflects local usage, says Mr. Palmer, as these despatches originate with newspaper correspondents who are residents of that region.

These evidences of local usage are interesting. That local usage is the factor first to be considered in deciding as to the proper name of geographical features is obvious. Nevertheless, it need not be the determining factor, as a local name may be, so to speak, a colloquialism. Local usage, less likely to bear in mind the broader relations of the parts to the whole, may be sound as to the name of a creek or ridge and not as to the river or mountain system to which each respectively belongs. That the U. S. Geographic Board is keenly alive, however, to the claims of local usage may be gathered from the following quotations from its latest, fourth, report, published in 1916:

"The Board is agreed that in general the name which is in common local use at present should be adopted. This is a broad, general principle, and summarizes the policy of the Board, with the exception of certain classes of names" (p. 14). . . . . "Especially does it seek after, and it generally obtains, the local usage, to which it attaches great importance. Local usage is usually obtained by correspondence with county clerks, postmasters, and residents who are conversant with local conditions. This information derived from correspondence is often supplemented by the oral testimony of individuals having personal knowledge of the name under consideration" (p. 21).

Transplantation of Chinese Fruit Trees to the United States. Agricultural exploration in China has enabled Frank N. Meyer of the U. S. Department of Agriculture to come to some interesting conclusions regarding the adaptability of Chinese fruits and vegetables to United States soil. Mr. Meyer's three journeys, made between 1905 and 1915, were chiefly conducted in the north and east of the country and the region adjoining. A résumé of his results in the *Yearbook of the Department of Agriculture for 1915* (pp. 205-224) indicates that a number of Chinese plants have already been acclimated in this country, where several climatic provinces find close counterparts in the region of the explorations. Many of the Asiatic varieties can be made to yield promising crops. Among these is the Chinese jujube, the dried fruit of which is exported from Shantung to South China. This tree can be grown in the semi-arid sections of our South and Southwest and possibly in southern Kansas and Nebraska. The Oriental persimmon is likewise adaptable to the Southwest; a thriving industry is centered around the cultivation of this fruit in China.

The large Chinese haw of the region around Taianfu in Shantung appears to be appropriate to those sections of our South which lie beyond the range of the apple. The productive area is a region of deficient rainfall where the winds bring scorching dryness as they blow. Nevertheless the Chinese have succeeded in developing large-fruited forms from the wild small-fruited prototype.

A type of tree practically unknown in the western hemisphere is the *yang-mae*, which bears a much appreciated fruit resembling somewhat the strawberry. This variety can be made to grow along the Gulf Coast and the milder portions of the Pacific Coast. Among ornamental trees the case is cited of a Manchurian elm, also found in North China, which thrives in alkaline soil and is not adversely affected by drought. As a shade tree and windbreak this variety bears promise of successful use in North Dakota and sections of the upper Mississippi Valley.

SOUTH AMERICA

Dr. W. C. Farabee's Explorations in the Amazon Basin, 1913-1916. In connection with Dr. W. C. Farabee's recent lecture before the Society (see above, under "American Geographical Society") a brief summary of his explorations is here given, mainly based on data kindly furnished by Dr. G. B. Gordon, Director of the University of Pennsylvania Museum. Notices of various phases of the trip have already appeared in these pages and elsewhere (*Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, pp. 369-370, Vol. 46, 1914, pp. 441 and 530-531; *Geogr. Rev.*, Vol. 1, 1916, p. 143; *Univ. of Pennsylvania Museum Journ.*, Vol. 6, 1915, pp. 1-54).

The expedition, whose objects were mainly ethnological, was sent out by the University of Pennsylvania Museum. Dr. William Curtis Farabee was the leader. He was absent in the field for over three years, from March, 1913, to June, 1916. The expedition visited four widely scattered areas, mainly in the Amazon basin: (1) the Guiana highlands, (2) the Ucayali River in Peru, one of the main source-streams of the Amazon, (3) the island of Marajó, at the mouth of the Amazon, and (4) the region in north-central Brazil between the Tapajoz and Xingú Rivers, two of the main right tributaries of the Amazon.

The expedition to the Guiana highlands lasted from about the middle of 1913 to April, 1914. Proceeding from Manaos via the lower Negro, Doctor Farabee ascended the Rio Branco, its main tributary, to its upper reaches, where it flows due east, instead of south-southwest, as in its lower course, and is known as the Uraricoera. The Uraricoera was ascended in canoes until the numerous rapids made further progress impossible. The point attained was three canoe journeys beyond the highest point reached by white men, thus evidently above the point at which Dr. Koch-Grünberg, the German ethnologist, left the river in 1912 to cross over to the Orinoco basin (see *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, pp. 664-666, with map). Returning down the Uraricoera Doctor Farabee in October reached Bôa Vista, a station on the upper Rio Branco. Three tribes were visited on this trip, the Porocotos, Ajamares, and Zaparas. From Bôa Vista Doctor Farabee made a side excursion to Mt. Roraima. He then started east through the territory of the Macusi Indians on the last and most arduous stretch of the journey. After a brief stay at Dada-nawa (2° 48′ N. and 59½° W.), the seat of the government agent for the Indians of southern British Guiana, Doctor Farabee in November continued eastwards through unknown territory in southern British Guiana, crossing the headwater streams of the Essequibo River at right angles and making a wide detour across the frontier into Brazil and back again into British territory. Depletion of his ammunition supply finally forced him to return to civilization by the quickest possible route, which proved to be by way of the Corentyne, the boundary river between Dutch and British Guiana. Georgetown was reached on April 19, 1914. On this trip, from the middle of December to the first of April, the party was among tribes who had never seen white men before. The following tribes were visited: Waiwai, Parikutu, Waiwē, Chikēna, Katawian, Toneyan, Diow, Kumayenas, and Urukuanas. Some evidently belong to Carib, others to Arawak stock.

After recovering in Barbados from the hardships of this trip Doctor Farabee returned to Para. Leaving here early in July he made the 3,000-mile journey up the Amazon to the upper Ucayali River. Here the following tribes were studied: Conibos, Cashibos, Sipibos, Cocamac, and Piros. From these explorations he returned to Para in October, 1914.

From the first of November of that year until the middle of February, 1915, Doctor Farabee was engaged in conducting archeological investigations on the island of Marajó in the estuary of the Amazon. The amphibious nature of the region is indicated by the fact that in periods of flood transportation is by canoes drawn by oxen through the tall reed grass which still protrudes several feet above the surface of the water.

Early in March, 1915, Doctor Farabee set out again. This journey was devoted to the region between the Tapajoz and Xingú Rivers. Along the lower reaches of the Tapajox the Maués were visited; along the middle reaches, the Mundurucus, whose central village in the interior, away from the river, Doctor Farabee was the first to visit. Along the upper reaches of the Tapajox, leading to the Juruena, the Apiacas were studied. The region between the Tapajoz and the Xingú was found to be savanna, a northward projection into the Amazon equatorial forest of the *campo geral* of south-central Brazil. The occurrence there of the emu, a bird adapted to a grassland environment, is an indication of this relation.

Route surveys were made wherever the expedition traveled in unknown territory. This was especially the case in the British Guiana-Brazil boundary region. A traverse, checked by astronomical observations, was made of the Corentyne River which corrects some wide errors in existing maps.

Colonel Fawcett's Explorations. Colonel Fawcett's accounts of his South American explorations are always interesting and often thrilling. Few living explorers have had the courage to return as he does again and again to the scenes of former hazards. In a recent article (Penetrating the South American Jungle, *Travel*, July, 1916) he amplifies a shorter account of his last expedition (see the *Geogr. Journ.*, Vol. 45, 1915, pp. 219-228) and gives some most interesting photographs of the savages whose remote realm he entered. It will be remembered that the precise location of the numerous tribes he discovered was not given, in view of the hope that at the close of the war a scientific expedition might be fitted out to make a thorough study of them. This hope is expressed again, and the account given in his latest paper will go far toward stimulating popular interest in his proposal. A first-class expedition is required, one commensurate in equipment and personnel with the importance of the task of conducting a major piece of exploration among a group of hostile tribes in a great region hitherto unknown.

Pacific Port Development in Colombia. Great opportunities have arisen for Buenaventura, Colombia's chief port on the Pacific Ocean, since the opening of the Panama Canal and the completion, two years ago, of the railroad connecting it with Cali in the Cauca Valley. At present the port is practically the sole outlet of the vast cattle lands and coffee plantations of this fertile valley. It has no modern shipping facilities and is unfortunately built on a low, unhealthful site. Since the visit of the yellow fever commission of the Rockefeller Foundation the question of sanitation has absorbed the attention of the government. The estimated cost of the necessary works in this respect and in that of harbor improvement are so high that the government is considering the alternative plan of moving the port. With this object in view the Colombian Congress has approved the appointment of a commission for the complete survey of Magdalena Bay immediately west of Buenaventura (*Commerce Repts.*, Oct. 17 and Nov. 17, 1916.)

EUROPE

The Geographical Basis of the French Spirit. Professor H. J. Fleure of the University College of Wales at Aberystwyth contributes a sound geographical interpretation of France to the November, 1916, issue of the *Scottish Geographical Magazine*. The features which have produced French unity and have made France a world-center of civilization have a geographical foundation. Physically France is made up of basins fringing plateaus of old rocks. A happy distribution of the lowlands has provided avenues through which far-spread influences have penetrated the country. Up the sunny corridor of Provence and Burgundy and through the narrow gate of Carcassonne came the visions of Mediterranean civilization to brighten the cloudier northern basins. The gates of Metz-Verdun, the Meuse-Sambre, and that of Ypres gather up roads from Central Europe and from Asia beyond. Then there are the ways of the sea. The Channel, that passed on Gallic civilization to Britain, gave the northerners an entry to France. The way of the open sea, Brittany, is one of those Celtic lands whose contributions to the life of Western Europe have been little appreciated as yet.

The meeting point of these roads is the Paris Basin, and there have met and blended the ideas and ideals that have traveled along them. And from the rich interweaving has been created the national spirit, of which the high expression is the Frenchman's ability to keep in sympathetic touch with the ideals and thought of other nations.

Cattle Resources and the War. The problem of the belligerents' supply of meat is the subject of a contribution to the *Annales de Géographie* for March 15, 1916, by Henri Hitier (pp. 81-96). At the beginning of the war about 15,000,000 head of cattle made up the French reserve. It soon became evident, however, that the rapid depletion brought about by war conditions was a serious threat to the very existence of the national supply. Before the war it was possible to slaughter annually some 2,000,000 oxen and export about 100,000 without reducing the total number in the country. At the end of the first year of fighting the national stock had been reduced to 12,300,000 head. To stop further inroads France began importing frozen meat and naturally turned to its colonies for supplies. In Madagascar, where cattle raising has always been an important industry, it was found that half a million head could be slaughtered annually without impairing the island's reserves. The attempts to ship live cattle to France having proved too costly, slaughter houses and the necessary plants were provided at Boamamary and Diego Suarez. Other colonies from which France draws for its meat consumption are French West Africa and New Caledonia. The protectorates of Tunis and Morocco have an annual excess of cattle which is of sufficient importance to constitute a further reserve.

In Great Britain an average of 1,250,000 tons of meat are consumed each year. Of this only 60 per cent is provided by home products. The first two years of the war appear to have brought little change in the British meat situation beyond a rise in the consumption per head on account of the necessity of providing the army with fighting rations. Russia is worse off than either France or England on account of her isolation and the difficulty of making good the annual deficit of 3,000,000 head brought about by the war. The country, however, had a large reserve at the beginning of the war from which she can draw for about ten years.

In considering sources of supply for the Allies' consumption Canada takes the lead in North America, the United States having become an importing country. In South America, Argentina, Uruguay, and Brazil can export increasing quantities year by year. It is now calculated that a minimum of 11,500,000 head of large cattle have to be slaughtered annually for the consumption of all the mobilized belligerents. The gravity of the situation for the isolated Central Powers is apparent. The situation is all the more serious when it is remembered that each year of the war sees a deterioration in the quality of the cattle and that ill-nourished beasts yield small meat returns.

Vulcan Enchained: Utilization of Steam for Power in Italy. In central Tuscany near Volterra volcanic activity appears in the form of numerous *soffioni*, powerful jets of superheated steam issuing from the fissured ground. The steam is impregnated with boron salts and has long been used in the production of borax and boric acid and incidentally for warming the houses of the adjacent village. In 1903 the enterprising president of the borax works attempted to utilize the steam as a source of motive power. By driving bore-holes to a depth of 300 to 500 feet he obtained steam at temperatures from 150° to 190° C. and under a pressure of two, three, or even more atmospheres. The experiments were continued on an increasing scale until the outbreak of the war, when the scarcity and high price of coal added to the prospective importance of the new source of power. The inventor promptly extended his installation and now can send power to Florence, Leghorn, Volterra, and other Tuscan industrial centers. It is proposed to introduce the method in other parts of Italy (*Engin. Suppl. of the London Times*, Nov. 24, 1916).

ASIA

Arabia, a New Sovereign State in Asia. As was foreseen in an article entitled "Europe at Turkey's Door" in the *Review* for April, 1916, the Arabs have declared and effected their independence of Turkish sovereignty, as reported to the State Department on November 11, 1916, by the Minister of Foreign Affairs of the new state in an undated telegram from Mecca. The Emir and Sherif of Mecca is the new ruler. His authority is strong in the Hejaz, where the influence of Mecca and Medina, the two holy cities of Islam, prevails. According to recent press reports, the Turkish armies elsewhere in the peninsula are being gradually overcome by the Arab insurgents, and it is not unlikely that the movement is the beginning of the complete detachment of Arabia from the Ottoman state.

Arabia became a dependent province exactly four hundred years ago. Turkish rule, however, was never enforced thoroughly. To the Arab, bred in a Mediterranean climate and inheritor of Babylonian and Egyptian civilizations, the Turk has always remained the barbarian who came from the cold steppes of Central Asia to destroy his work of civilization. The desert and the inaccessible retreats of the interior plateau strengthened the spirit of independence in the Arab. Much of the success of the Arabian revolution is due to the inability of the Turk to withstand the climate of the peninsula. In vain has the flower of Ottoman manhood, recruited from the valleys of Macedonia or Anatolia, been sent in yearly streams for the last forty years to quell Arabian revolts. Arabian history is a tale of factional strife. Life in the barren stretches of the peninsula is beset with difficulties. Isolated districts became seats of petty principalities. The nearest approach to unity was supplied by the bond of Islam soon after Mohammed's conquest of Mecca. But the influence of a central government, organized to rule, has never been felt in the region. The new state today is bound by strong ties to Great Britain and France. The population, estimated at over 10,000,000, may soon derive from this contact the advantages already obtained by the Egyptians and Algerians.

A Proposed New Water Route to Siberia. The establishment of a sea route between Siberia and Western Europe has been the dream of a long succession of navigators. Definite hopes for its realization have followed on the successful voyages accomplished by Jonas Lied (see *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, pp. 134-135, and *Geogr. Journ.*, Vol. 43, 1914, pp. 481-500), whose return from his 1916 trip is an-

nounced by the *Russian Section of the London Times* for December 30, 1916 (see also "Northern Routes of Commerce between Europe and Asia," *Geogr. Rev.*, Vol. 1, 1916, p. 144). As Nansen points out in "Through Siberia," we still know very little of physical conditions in the Kara Sea, whose ice-blocked waters prove the chief obstacle along the route, and the certainty of navigation as a regular economic movement is hardly assured. In this connection it may be remarked that valuable data are anticipated from the recently created meteorological station of Port Dickson, at the mouth of the Yenisei estuary. Moreover, wireless reports from this station have proved so valuable that it is hoped to establish another on White Island, at the western entrance to the Gulf of Ob.

Meanwhile a new solution of the navigation problem has been proposed by K. Nosilov, an experienced Russian traveler and explorer (*Russian Section of the London Times*, Nov. 25, 1916). M. Nosilov believes that a route can be established across the Yamal Peninsula, which thrusts forward its mass between the Kara Sea and the Gulf of Ob, over ground anciently traversed by the intrepid Novgorodian traders but since their passing left almost without interruption to the sole occupancy of the nomadic Samoyeds. The proposed route will be taken across the base of the peninsula, a degree or more south of the principal navigation line and portage of the Novgorodians. By this means the voyage through the Kara Sea will be obviated, and advantage can be taken of the early disappearance of ice from the Kara Gulf. The route will make use of portions of the rivers Saletta and Yuribei flowing into the Ob and Kara Gulfs respectively. The river channels will be deepened where necessary, and across the low, lake-studded watershed a canal will be cut. Altogether the length of the route is estimated at 130 miles. On the Kara Gulf near Cape Morra-sale a good natural harbor has been selected for the ocean port, where will be transhipped freight brought on river boats from the Ob. The concession has already been granted by the government, and the beginning of construction work is planned for the spring of 1917. If successful, this venture will open up a little known region (see also *Board of Trade Journal*, January 4, 1917, p. 55, which also states that the "Obi-Yenisei Canal" is now under construction). Our chief geographical data on it comes from the reports of the Russian Geographical Society's expedition of 1908, of which a résumé and a valuable map by B. M. Shitkow may be found in *Petermanns Mitteilungen* for 1911 (Vol. 57, Pt. 2, pp. 11-14, 67-71, and Pl. 3; see also the same author's article on the sea route to Siberia, *Geogr. Zeitschr.*, Vol. 18, 1912, pp. 202-213).

Natural Resources of Formosa. Formosa, or—to use the official Japanese name—Taiwan, is a rice-growing country, two crops being obtainable annually wherever the water supply is abundant. Under Japanese administration, in effect since 1895, the area under cultivation has been greatly extended and includes the upland as well as the lowland variety. In 1915 the production of this staple amounted to 4,784,587 *koku*, or 23,731,551 bushels, according to figures given in the "Sixteenth Financial and Economic Annual of Japan" issued by the Department of Finance at Tokyo, 1916 (pp. 189-191). In the northern districts Oolong and Pouchong teas are the principal products. Although little progress has been made in this branch of production, export was valued at over 4,000,000 in 1915, a gain due to the high market created by the war. Sugar-cane cultivation has improved during the last decade, a number of modern factories having been built since 1908. The island yield of camphor and tobacco is also satisfactory. Camphor is obtained from the *kusu* tree and ranks as the most important forest product of Formosa. Considerable sections of forested areas still await exploitation, especially in the regions in which the natives have not been pacified. Northern Formosa is also known for its mineral production, which comprises gold, copper, petroleum, sulphur, and phosphorus. The total value of mineral products, less than $150,000 in 1899, reached about $2,500,000 in 1915, and the progress of exploration indicates this latter figure susceptible of further increase. In the development of this and other industries the active participation of the government is apparent. A particular feature of it is the system of monopolies. First granted in respect of opium as a restrictive measure, the system has been subsequently applied to the exploitation of salt, camphor, and tobacco and has proved a financial and economic success.

PHYSICAL GEOGRAPHY

Atmospheric Pressure-Change Charts. A paper entitled "On Pressure-Change Charts," by Edward H. Bowie, in the March, 1916, *Monthly Weather Review* should be of considerable interest to geographers, because it shows the kind of geometrical complications arising when changes of moving phenomena are charted. Isallobaric

(pressure-change) charts have been recognized for a long time as important aids in weather forecasting. Even a casual examination of such charts shows that the movement of areas of maximum and minimum change seems to have very little relation to the positions of cyclones and anticyclones. This discordance has led to the belief that the pressure change should be regarded as an independent phenomenon. Mr. Bowie shows that cyclonic systems of the most simple form and movement result in complicated pressure changes. These simplified ideal cyclones and anticyclones show "that the isallobaric charts are but representations of pressure changes that result directly from the movements of and changes of pressure level in highs and lows, and nothing more. It is obvious, however, that, the nature of these maximum pressure changes being known, many precepts that will materially aid the forecaster may be found." Mr. Bowie has pointed out clearly that the isallobaric charts, properly used, give the forecaster at a glance information which he could only obtain from a careful study of the isobaric maps at the beginning and end of the interval covered by the isallobaric map.

The paper emphasizes the importance of paying particular attention to the necessary geometric consequences of charting moving phenomena. The movements of the areas of great and little change are shown to be the inevitable result of the movement and changes of the phenomena for which the change is charted. It is obvious that this principle is one which has a wide application and that the caution implied in the paper should be heeded in all investigations dealing with such phenomena, regardless of how erratic the movement of areas of change appears to be when compared with the movements of the areas resulting in the changes. It also furnishes another illustration of the necessity of a careful investigation of the different phenomena to show what relations exist between them and for a thorough consideration as to which is the cause and which is the result.

WILLIAM GARDNER REED.

ECONOMIC GEOGRAPHY

Production of Synthetic Nitrate. The production of synthetic nitrate is one of the outstanding problems of industrial preparedness. A part of its significance lies in the unique relation the nitrate products hold in their adaptation to the arts of both war and peace. A plant using the new cyanamide process can readily convert its production of fertilizer during times of peace to nitric acid and its derivatives in event of war. The present efforts on the part of the Central Powers show the value of independence of the Chilean sources of supply apart from consideration of the much-debated question of exhaustion of the natural deposits. As a national problem the manufacture of a synthetic nitrate is now being studied by a special committee composed of the members of the National Academy of Sciences and the Naval Consulting Board, and the sum of $20,000,000 has been appropriated for a nitrate and fertilizer plant. Geographically the chief interest of the problem lies in its dependence on a supply of cheap water power. Hence its future in the United States is bound up with the development of hydro-electric resources and is thus related to several pressing questions of control and finance. It may be remembered that the first attempted production of fixed nitrogen was made by two Americans at Niagara in 1902, but their venture failed because of the high cost of hydro-electric power (L. H. Baekeland: Renewing the Earth from the Air, *Scribner's Magazine*, November, 1916).

EDUCATIONAL GEOGRAPHY

Need of Publicity for Geography in Educational Circles. Physical geography today is faring badly in the secondary schools. It is being displaced in large numbers of high schools each year, and is being almost ignored in many others. The last figures available are for the year 1910, when the percentage of high-school pupils enrolled in physical geography showed a falling off of nearly 50 per cent as compared with its maximum.

During these years when our subject has been rapidly losing ground as a school subject, history, which in Europe is often the companion of geography, has been making great gains. History is now getting three or four years of time in the secondary school courses, while geography is fortunate to secure one year or even a half year. While fully recognizing the value of history, I cannot believe that six semesters of history are educationally better than four semesters of history and two of geography. I am confident that if the question were effectively presented to them, school men will grant that geography is a fundamental branch of study, essential to a broad education, and deserving of a place in the schools.

With respect to geography, the important matter of educating school administrators is being overlooked. Geographical articles in the leading educational magazines are a rarity. School principals, superintendents, and normal school presidents seldom see an article which starts them to thinking on the subject of geography in education. They see any number of articles on general science, agriculture, manual training, and commercial branches: on history, and English, and the languages, but only now and then is a voice raised through the educational press in the interests of geography. It must be remembered that the *Journal of Geography* reaches very few of the men who administer our school systems.

The four educational periodicals of scholarly character and wide circulation in this country are the *School Review*, the *Educational Review*, the *Pedagogical Seminary*, and *Education*. The *School Review* prints nearly 1,000 pages a year. In the last ten years—embracing nearly 10,000 pages—it has had one 2½-page geographical article (on map drawing), but in the first ten volumes it had eight articles, including three by Professor Davis, two by Professor Tarr, and one by Professor Brigham. The *Educational Review* has had one geographical article in the last twelve volumes, but had fourteen articles in the thirty-four preceding volumes. The *Pedagogical Seminary* has published no geographical article in eight years, and only two in the twenty-one years of its existence. Nearly two-thirds of the volumes of *Education* have no article on geography. This magazine has had only thirteen such articles in thirty-five volumes. The U. S. Bureau of Education's bibliography of educational papers shows a progressive decline in the number of papers on geography.

This situation seems to need attention; perhaps it ought to be the attention of the Association of American Geographers and the American Geographical Society. The present is a favorable time to launch a campaign in support of geography as a branch of education. More Americans are today interested in matters geographical and semi-geographical than ever before. The public mind is in a favorable attitude, and school men are always ready to aid a movement that has public support. R. H. Whitbeck.

GEOGRAPHICAL NEWS

Personal

Captain Roald Amundsen, whose visit to this country for the purchase of an aëroplane for his proposed drift expedition across the North Polar basin was noticed in the December *Review* (pp. 473-474), left New York on January 27 on the S. S. *Philadelphia* to return to Norway.

Professor Raoul Blanchard, professor of geography at the University of Grenoble, has been appointed visiting professor from France at Harvard University for the second half of the current academic year. Professor Blanchard is one of that company of pupils of Vidal de la Blache who have been instrumental in bringing the subject of geography to its present high state of development in France. He is best known for his "La Flandre: Étude géographique de la plaine flammande en France, Belgique et Hollande," Paris, 1906, an admirable, well-balanced interpretation of the physical and human geography of a natural region. Since his occupancy of the chair of geography at Grenoble he has devoted his attention to the anthropogeography of the French Alps. He is editor of the *Recueil des Travaux de l'Institut de Géographie Alpine*, which, besides contributions from his students, often contains articles from his pen. In his "Grenoble: Étude de géographie urbaine," Paris, 1911, he has given us a model city geography.

Dr. Frank N. Chapman of the American Museum of Natural History reported on his recent expedition to South America in a lecture on January 2 before the Linnæan Society of New York entitled "An Ornithological Reconnaissance of South America."

Professor H. J. Cox of the U. S. Weather Bureau personally conducted the members of the Geographic Society of Chicago through the Chicago office of the Weather Bureau on February 3, showing them the workings of the instruments used in weather observations and explaining the method employed in forecasting.

Dr. William Curtis Farabee of the University of Pennsylvania Museum, whose lecture before the American Geographical Society is referred to above, spoke on "Explorations in the Amazon Valley and in the Unknown Guianas, 1913-1916" before the Geographical Society of Philadelphia on January 19. On this occasion the Society's Elisha Kent Kane Medal was awarded to Doctor Farabee.

MR. HERBERT W. GLEASON, vice-president of the Appalachian Mountain Club, gave a lecture on February 7 before the Geographical Society of Philadelphia entitled "Scenic Alaska."

DR. CURT C. HOSSEUS has been appointed to the chair of botany and zoölogy in the Faculty of Science at the University of Córdoba, Argentina.

PROFESSOR EMMANUEL DE MARTONNE, who has been giving courses at Columbia University as visiting French professor for the first half of the current academic year, sailed for France on January 27. Among lectures given by Professor de Martonne during the last weeks of his sojourn was one in French on Rumania before the Alliance Française of New York at the Waldorf Astoria Hotel on December 20.

MR. N. C. NELSON read a paper on "The Southwest Problem" before the American Ethnological Society and the section of anthropology and psychology of the New York Academy of Sciences on January 29.

PROFESSOR G. B. ROORBACH of the Wharton School of Finance and Commerce of the University of Pennsylvania gave a lecture on "Venezuela" before the Geographic Society of Chicago on February 9.

MR. JOHN G. ROTHERMEL, director of the Wagner Free Institute of Science, Philadelphia, addressed the Geographical Society of that city on the "Petrified Forest and Painted Desert, Arizona" on the occasion of the society's first scientific meeting on January 26.

HON. ROBERT STERLING YARD of the U. S. Department of the Interior was speaker of the evening at the exercises signaling the establishment of the National Park Service of the United States Government under the joint auspices of the Department of the Interior, the American Scenic and Historic Preservation Society, and the American Museum of Natural History at the Museum on January 10, 1917. The creation of the National Park Service by act of Congress approved August 25, 1916, to have the supervision, management, and control of the several National Parks and National Monuments which are now under the jurisdiction of the Department of the Interior, the Arkansas Hot Springs Reservation, and such other national parks and reservations of like character as may hereafter be created by Congress, has long been advocated by various civic and scientific bodies and marks a notable advance in the movement for the protection and public enjoyment of the scenic, scientific, and historic treasures of the country.

OBITUARY

DR. MAX GROLL, instructor in cartography in the department of geography of the University of Berlin and in the Oceanographical Institute of that city, died on November 3, 1916, in his forty-first year. Doctor Groll is best known by his admirable bathymetrical charts of the oceans (Tiefenkarten der Ozeane, *Veröffentl. des Inst. für Meereskunde, Neue Folge, A: Geogr.-naturwiss. Reihe*, Heft 2, Berlin, 1912) which were reviewed in the March, 1916, number of the *Review* (p. 213). These maps are models of geographic representation. Doctor Groll was also the author of an excellent small manual on cartography (Kartenkunde: I, Die Projektionen; II, Der Karteninhalt, 2 vols., Leipzig, 1912; reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, p. 542).

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

General

TYRRELL, J. B., edit. **David Thompson's narrative of his explorations in western America, 1784-1812.** lxiv and 582 pp.; maps, ills., index, bibliogr. The Champlain Society, Toronto, 1916. 10 x 7.

This narrative is an entertaining account of Thompson's travels, written by a natural story teller. His observations, covering a wide range of subjects, appear to have been systematic rather than haphazard, and to all Thompson gave the fullest contemplation. Naturally from a fur trader should come notes on the habits of animals, and such as Thompson gives are more than superficial jottings. Then again, Thompson spent much time among the Indians of the Northwest, and his ability to deal sympathetically with the various tribes not only enhanced his value as a fur-trader but also allowed him to learn and understand to a high degree their theory of life; thus making his accounts of the many tribes particularly trustworthy and valuable. To list the items which attracted the eyes and mind of Thompson would take much space; so many are they, so carefully does he record them, and so much did he do in opening the great Northwest that the reader, as he ends the final chapter and studies the maps, will agree with the editor that the life and work of such a man should not be allowed to lie in obscurity, but that some tribute should be made "as a token of respect for the man and his work."

Thompson traveled more than 50,000 miles in this time as a trader, and in addition to the immediate duty of seeking pelts he surveyed the entire area of his travels and checked much of his work by later surveys. Of his work as a surveyor, topographer, and geographer, the editor of this narrative, J. B. Tyrrell, a geologist familiar with the region of Thompson's labors, has the highest regard. To the strict test of surveys and observations on the ground Tyrrell subjected the work of Thompson and found the work "of the very highest order," and he at the same time formed so great an "admiration for this fur-trading geographer" that he has edited this volume as a monument to Thompson.

R. M. BROWN.

WOOD, R. K. **The tourist's Northwest.** xiv and 528 pp.; maps, ills., index. Dodd, Mead & Co., New York, 1916. 8 x 5.

The author's intentions have to be judged by the contents, as this volume is without an introduction. The Northwest as here presented includes the American Northwest of Oregon and Washington and also the Canadian Northwest of Alberta and British Columbia. Considerable space is devoted to hotels, railroads, and local itineraries. The author has collected the essential things that are of value for the tourist to these regions. Crater Lake, the Columbia River, and Mt. Rainier are given popular descriptions, accompanied by accurate information regarding rates and routes. In Canada the chief points are Glacier, Banff, Lake Louise, and Victoria. Some of the descriptions are well done and others are highly enthusiastic. The handbook contains an immense amount of information gained from chamber of commerce reports and popular publications. If this book is intended for the tourist on the road, its heavy covers, thick paper, and size make it a clumsy volume. It would have been better to make two volumes for the same material, finer type, smaller page, good local maps, and limp covers. The five maps are excelled by those generally furnished gratis by the railroads.

However, the tourist to the Northwest will find this handbook of value to use along with the latest Baedeker and especially the guide books issued by the respective governments.

W. M. GREGORY.

—— **American Indian, A museum of the.** *The Outlook*, Vol. 114, 1916, Oct. 11, No. 6, p. 301. [Refers to the museum described in the December *Review*, pp. 407-418.]

ANDREWS, C. L. **Marine disasters of the Alaska route.** *Washington Hist. Quart.*, Vol. 7, 1916, No. 1, pp. 21-37. [The thousand-mile-long channel from Seattle to Skagway, Alaska.]

BLINK, H. **De scheepvaart- en scheepsbouwvraagstukken in Noord-Amerika.** Diagr. *Tijdschr. voor Econ. Geogr.*, Vol. 7, 1916, No. 3, pp. 89-99.

BURTON, C. M., AND M. A. BURTON, edits. **The journal of J[ohn] L[ees], of Quebec, merchant.** 55 pp.; maps, index. Soc. of Colonial Wars of the State of Michigan, Detroit, 1911. $2.00. 9½ x 6. [Date: April to October, 1768; route: London, Boston, New York, Albany, Buffalo, Detroit, down Lakes Ontario and Erie and the St. Lawrence to Montreal.]

CAMPBELL, J. V. **The Sinclair party: An emigration overland along the old Hudson Bay Company route from Manitoba to the Spokane country in 1854.** *Washington Hist. Quart.*, Vol. 7, 1916, No. 3, pp. 187-201. ["This article was collated and prepared by Mr. William S. Lewis, from a series of letters written to him by Mr. John V. Campbell of Lillooet, British Columbia."]

DA VELLA, —. **La produzione del petrolio nel Nord-America in rapporto colla produzione mondiale petrolifera.** 13 pp. [*Boll.*] *Direz. Gen. degli Affari Commerc.*, 1915, No. 15. Minist. degli Affari Esteri, Rome.

FROTHINGHAM, E. H. **The northern hardwood forest: Its composition, growth, and management.** 79 pp.; map, ills. *U. S. Dept. of Agric. Bull. No. 285.* Washington, D. C., 1915. [For abstract, see the April, 1916, *Review* (Vol. I, p. 298).]

GRIFFIN, G. G., comp. **Writings on American history, 1913: A bibliography of books and articles on United States and Canadian history published during the year 1913, and some memoranda on other portions of America.** xvii and 193 pp.; index. Yale University Press, New Haven, 1915. $2.00. 10 x 7. ["Eighth number of a continuous series opening with 1906."]

HEADLAM, CECIL. **America and West Indies, 1704-1705: Calendar of state papers, colonial series.** xl and 807 pp.; index. The Hereford Times, Ltd., London, 1916. 15s. 10½ x 7½.

MOLBECH, O. C. **Pelsvaerkshandelen i Nordamerika.** *Geografisk Tidskrift*, Vol. 23, 1915-16, No. 5, pp. 179-188. Copenhagen.

NICKLES, J. M. **Bibliography of North American geology for 1915, with subject index.** 144 pp. *U. S. Geol. Survey Bull. 645.* Washington, D. C., 1916.

CANADA

Yukon, Northwest Territories, British Columbia

COLLISON, W. H. **In the wake of the war canoe: A stirring record of forty years' successful labor, peril, and adventure amongst the savage Indian tribes of the Pacific Coast and the piratical head-hunting Haidas of the Queen Charlotte Islands, B. C.** 352 pp.; map, ills., index. E. P. Dutton & Co., New York, 1916. 8 x 5.

The subtitle of this volume connotes a sensationalism which is entirely foreign to its contents, for it is indeed the simple narrative of the life of a pioneer missionary on the British Columbia coast. Into this have been woven many facts of ethnologic and historic interest. It is to be wished that Mr. Collison had made his record of fact relating to the primitive customs and mode of life of the Haidas more complete, for he was the first scholar to become intimately acquainted with these people.

The volume deals specifically with the Tsimshians of the Nass and Skeena River region, and with the Haidas of the Queen Charlotte Islands. An all too brief chapter is devoted to the Tsetsant (spelled Zitz-Zaow by the author) Indians. This tribe, now practically extinct, previously occupied Portland Canal and is a foreign element on the coast, for it belongs to the Athapascan stock of the interior.

In addition to containing much valuable ethnologic data, the volume also includes some important historical matter relating to the missions and the early settlements along the northwest coast of British Columbia. It is above all a valuable record of the conditions of travel and life during an epoch which has now passed, and presents a vivid picture of the conditions which confronted the pioneer missionary. The book contains many good halftones, chiefly illustrating Indian life. One of these shows a well-built truss bridge which, though evidently the work of white men, is credited to Indian craft. The map which accompanies the volume has nothing to recommend it. It is poorly drawn, badly reproduced, and so full of glaring errors as to disfigure a book that in other respects has been printed in very attractive form. A. H. BROOKS.

COOPER, W. S. **Plant successions in the Mount Robson region, British Columbia.** *Plant World*, Vol. 19, 1916, pp. 211-238.

Mount Robson is situated in the Canadian Rockies near the eastern boundary of British Columbia. It lies in a region which, so far as ecological study is concerned,

is unknown. The forests here are transitional between those of the Pacific Coast and those of the Rocky Mountains. Two forest zones are distinguished: the montane zone, extending up to 3,250 feet, and the sub-alpine zone, extending from 3,250 feet up to timber line at 6,500 feet. The climax forest in the montane zone, made up of *Thuja plicata, Picea Engelmannii, Tsuga heterophylla, Pseudotsuga mucronata,* and *Abies lasiocarpa,* is of the Pacific Coast type. The climax forest of the sub-alpine zone, consisting of *Picea Engelmannii* (dominant), *Abies lasiocarpa,* and *Pinus albicaulis,* and differing from that of the montane zone in the smaller number of species and in the smaller size of the trees, belongs rather to the Rocky Mountain region. The succession of plant associations on talus moraines and shingle flats is described in some detail. Successions in the two zones are much alike, and all of them lead to the establishment of a climax forest. Some interesting correlations are pointed out between the ages of trees growing on the successive terminal moraines of the retreating Robson Glacier and the rate of retreat. GEORGE E. NICHOLS.

SHAW, C. H. **The vegetation of the Selkirks.** Map. *Botanical Gazette,* Vol. 61, 1916, No. 6, pp. 477-494.

Doctor Shaw, who was drowned in 1910, left a collection of notes from which this paper has been compiled.

The region of the Selkirks is entirely forest-clad up to the timber line, at an average elevation of 6,200 feet. Below 4,600 feet the forest may be classed as montane. It is broadly distinguished into eastern and western divisions by the greater luxuriance of the latter. The montane forest passes upwards into a sub-alpine formation, which, in turn, interlocks with alpine meadows. The limit between trees and grass is mainly governed by topography and exposure. Where sheltered depressions collect heavy, long-enduring snows, tree growth is suffocated and the tree line dips downwards. Snow and low temperatures control the upper limit of the meadows, but rock avalanches also constitute an ecological factor determining the occurrence of desert.

CAIRNES, D. D. **Mayo area; Scroggie, Barker, Thistle, and Kirkman Creeks; Wheaton District, Yukon Territory.** Maps, bibliogr. *Summary Rept. Geol. Survey of Canada for 1915,* pp. 10-49. Ottawa, 1916.

CAMSELL, CHARLES. **An exploration of the Tazin and Taltson Rivers, North West Territories.** 124 pp.; map, ills., index. *Geol. Survey of Canada Memoir 84: Geol. Series No. 69.* Ottawa, 1916. [Abstracted in the October *Review,* p. 302.]

CAMSELL, CHARLES. **Exploration in the northern interior of British Columbia.** Map, bibliogr. *Summary Rept. Geol. Survey of Canada for 1915,* pp. 70-75. Ottawa, 1916.

COLEMAN, A. P. **Glaciers of the Rockies and Selkirks.** 29 pp.; ills. Dominion Parks Branch, Dept. of the Interior, Ottawa, [1916?].

DAWSON, W. B. **Tide tables for the Pacific coast of Canada for the year 1917, including Fuca Strait, the Strait of Georgia, and the northern coast. With data for slack water in the navigable passes and narrows and information of currents.** 64 pp. Tidal and Current Survey, Dept. Naval Service of the Dominion of Canada, Ottawa, 1916.

DRYSDALE, C. W. **Bridge River map-area, Lillooet mining division; the Highland Valley copper camp, Ashcroft mining division; human skeleton from silt bed near Savona, British Columbia.** Maps, diagrs., bibliogr. *Summary Rept. Geol. Survey of Canada for 1915,* pp. 75-92. Ottawa, 1916.

DRYSDALE, C. W. **Geology and ore deposits of Rossland, British Columbia.** xviii and 317 pp.; maps, diagrs., ills., index, bibliogr. *Geol. Survey of Canada Memoir 77: Geol. Series No. 64.* Ottawa, 1915.

MACKENZIE, J. D. **Telkwa valley and vicinity, British Columbia.** Maps, bibliogr. *Summary Rept. Geol. Survey of Canada for 1915,* pp. 62-69. Ottawa, 1916.

—— **Nakimu caves, The, Glacier Dominion Park, B. C.** 29 pp.; map, ills. Dominion Parks Branch, Dept. of the Interior, Ottawa, 1914.

—— **Railway tunnel in America, The longest: The Roger's Pass bore through the Selkirk Mountains in British Columbia.** Map, diagr., ills. *Sci. Amer. Suppl.,* No. 2096, Vol. 81, 1916, Mar. 4, pp. 152-153.

SAPIR, E. **The social organization of the west coast tribes.** *Trans. Royal Soc. of Canada,* Ser. 3, Vol. 9, 1915, pp. 355-374.

SCHOFIELD, S. J. **Geology of Cranbrook map-area, British Columbia.** vii and 245 pp.; maps, diagrs., ills., index, bibliogr. *Geol. Survey of Canada Memoir 76: Geol.*

Series No. 62. Ottawa, 1915. [With a chapter on the regional physiography (Purcell Range) and a geological map, 1:126,720.]

—— ***White River district, Upper Yukon Territory.*** 1:250,000. Geological Survey of Canada. Map 122A. [Ottawa], 1915.

UNITED STATES

General

MERENESS, N. D., edit. **Travels in the American colonies.** 693 pp.; index. The Macmillan Co., New York, 1916. $3.00. 9 x 5½.

This book is a transcription of eighteen manuscripts which contain the records of divers journeys and missions in the American colonies between the years 1690 and 1783. The editing of the travels has been done carefully; each manuscript is introduced by a brief statement which gives as far as it is known the purpose of the journey, the political situation along the route, and pertinent extracts from the life of the participant. A wide range of subjects is treated in the volume, and a more personal touch with the conditions under which the colonists lived is vouchsafed the reader than can be obtained from an interpretation by an historian. Among the manuscripts there may be found a journey from Virginia to New England in 1690 on a political mission, an account of a year's captivity among the Cherokee Indians, missions to the Creeks and the Choctaws, the migration of the Moravians from Pennsylvania to North Carolina, a visit from New York to Philadelphia during the troublous days of 1778, and the travels of a bishop and his party to fulfill their duties. This group of travelers, not unlike modern explorers, show a wide variation in the kinds of material noted as of value. In a number of instances, as particularly in Cuthbert Potter's journal, when the traveler was not directly concerned with his mission, the notes deteriorate to a mere mention of the stages of the journey, while in others, the journal of Diron D'Artaguiette of Louisiana for example, the reader gains an insight into the stage of culture, the climate, and the vegetation, as well as into the political status of the land. R. M. BROWN.

PUTNAM, G. R. **The Lighthouse Service and its relation to the United States Coast and Geodetic Survey.** *Science,* May 12, 1916, p. 670. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

ROMAN, C. V. **American civilization and the negro.** xii and 434 pp.; ills., glossary, index. F. A. Davis Co., Philadelphia, 1916. $2.50. 9½ x 6. [For extended review, see article "Our Immigrant Problem," by Ellsworth Huntington in the December, 1916, *Review,* pp. 458-463.]

ROSS, E. A. **The Old World in the New: The significance of past and present immigration to the American people.** viii and 327 pp.; maps, diagrs., ills., index. The Century Co., New York, 1914. $2.40. 8½ x 6. [For extended review, see article "Our Immigrant Problem," by Ellsworth Huntington in the December, 1916, *Review,* pp. 458-463.]

SCHOFF, W. H., edit. **[Report of proceedings of] Eighth annual convention of the Atlantic Deeper Waterways Association held at Savannah, Georgia, November 9, 10, 11, and 12, 1915, with preliminary sessions at Richmond, Va., Raleigh, N. C., and Columbia, S. C., November 7 and 8, 1915.** 311 pp.; maps, ills. Atlantic Deeper Waterways Association, Philadelphia, 1916.

SCHUCHART, T. **Der Aussenhandel der Vereinigten Staaten von Amerika: Eine statistische Studie.** 34 pp.; diagrs. *Meereskunde: Sammlung volkstümlicher Vorträge,* Vol. 9, 1915, No. 11. Berlin.

SMITH, G. O. **The United States Geological Survey and its relation to the United States Coast and Geodetic Survey.** *Science,* May 12, 1916, pp. 659-665. [Address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

SMITH, H. M. **The Bureau of Fisheries and its relation to the United States Coast and Geodetic Survey.** *Science,* May 12, 1916, pp. 665-666. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

—— **State supplements to Frye's Primary Geography: (1) The New England States.** By J. S. Vaughn. 8 pp. [1915]. (2) **Middle Atlantic States.** 18 pp. [1915]. (3) **Washington and the District of Columbia.** By Ella Given. 6 pp. (4) **Central States (Eastern Section).** 8 pp. [1915]. (5) **State of Washington.** 8 pp. [1915]. Ginn & Co., Boston. 10 x 8.

—— **State supplement to Frye's Home Geography: (1) New Jersey.** 10 pp. 1912. (2) **Pennsylvania.** 14 pp. 1912. (3) **Washington.** 9 pp. 1912. Maps, ills. in each. Ginn & Co., Boston. 8 x 6 each.

—— **State supplements to Frye's Higher Geography:** (1) **Delaware.** By E. L. Cross. 12 pp. 1915. (2) **Mississippi.** By J. N. Poers. 16 pp. 1915. (3) **New Jersey.** By Ella Huntting. 15 pp. 1914. (4) **South Carolina.** By Frank Evans. 12 pp. 1906, 1912. Maps, ills. in each. Ginn & Co., Boston. 12 x 10 each.

—— **State supplements to Maury's New Geographies:** (1) **Texas.** By R. T. Hill. 18 pp. 1908, 1912. (2) **Virginia.** By W J McGee. 18 pp. 1908. Maps, diagrs., ills. in each. American Book Co., New York. 12 x 10 each.

—— **State supplements to Redway and Hinman's Natural Geographies:** (1) **Alabama.** By J. L. M. Curry. pp. 1-6. 1898, 1913. **Mississippi.** By J. L. M. Curry. pp. 7-12. 1898, 1913. **Louisiana.** By W. W. Clendenin. pp. 13-17. 1898, 1913. **Arkansas.** By A. H. Purdue. pp. 18-22. 1898, 1913. (2) **California.** 12 pp. 1899. (3) **Colorado.** 13 pp. 1914. (4) **Florida.** By W. F. Yocum. 12 pp. 1910, 1913. (5) **Georgia.** By D. Q. Abbott. 7 pp. 1898. (6) **Idaho.** 12 pp. 1907, 1914. (7) **Illinois.** 12 pp. 1908, 1913. (8) **Indiana.** By C. R. Dryer. 12 pp. 1909. (9) **Iowa.** By George Chandler. 9 pp. 1898, 1907, 1912. (10) **Kentucky.** 10 pp. 1909, 1914. (11) **Maine.** By W. W. Stetson. pp. 1-7. 1898, 1913. **New Hampshire.** By L. J. Rundlett. pp. 8-13. 1898, 1913. **Vermont.** pp. 14-17. 1898, 1913. **Massachusetts.** By J. C. Lyford. pp. 18-26. 1898, 1913. **Connecticut.** pp. 27-34. 1898, 1913. **Rhode Island.** pp. 35-38. 1898, 1913. (12) **Maryland.** By C. L. Garrison. pp. 1-7. 1898, 1913. **Delaware.** By C. L. Garrison. pp. 8-9. 1898, 1913. **District of Columbia.** By C. L. Garrison. pp. 10-14. 1898, 1913. (13) **Michigan.** By L. H. Wood. 16 pp. 1910, 1914. (14) **Minnesota.** By C. W. G. Hyde. 10 pp. 1898, 1914. (15) **Missouri.** By J. A. Merrill. 10 pp. 1898, 1907, 1912. (16) **Montana.** 20 pp. 1912. (17) **Nebraska.** By C. G. Pearse. 10 pp. 1898, 1908, 1913. (18) **Nevada.** 6 pp. 1907. (19) **New Mexico.** By C. M. Light. 12 pp. 1912. (20) **New York.** 27 pp. 1912, revised to 1915. (21) **North Carolina.** By Collier Cobb. pp. 1-8. 1898, 1913. **South Carolina.** By L. C. Glenn. pp. 9-14. 1898, 1913. (22) **North Dakota.** By L. L. Perrine. 12 pp. 1912, revised 1915. (23) **Ohio.** By W. M. Gregory. 20 pp. 1914. (24) **Oklahoma.** 10 pp. 1908, 1912. (25) **Oregon.** 10 pp. 1907. (26) **Pennsylvania.** By M. G. Brumbaugh. pp. 1-10. 1898, 1913. **New Jersey.** By V. L. Davey. pp. 11-16. 1898, 1913. (27) **South Dakota.** By Doane Robinson. 12 pp. 1912, revised 1915. (28) **Tennessee.** By J. M. Safford. 8 pp. 1898, 1909, 1913. (29) **Utah.** By J. H. Paul. 20 pp. 1908, 1912. (30) **Washington.** By Solon Shedd. 16 pp. 1910, 1912. (31) **West Virginia.** By R. A. Armstrong. 16 pp. 1912, revised to 1915. (32) **Wisconsin.** By R. G. Thwaites. 8 pp. 1898, 1911. (33) **Wyoming.** 11 pp. 1914. Maps, diagrs., ills. in each. American Book Co., New York. 12 x 10 each.

STRATTON, S. W. **The Bureau of Standards and its relation to the United States Coast and Geodetic Survey.** *Science,* May 12, 1916, p. 667. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

TITTMANN, O. H. **The international work of the United States Coast and Geodetic Survey.** *Science,* May 12, 1916, p. 672. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

—— **United States, Statistical abstract of the, 1915.** 749 pp.; index. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C., 1916.

—— **United States Coast and Geodetic Survey, The one-hundredth anniversary of the.** *Science,* May 12, 1916, pp. 655-674. [The papers and abstracts constituting this article are listed individually.]

WAINWRIGHT, RICHARD. **The Civil War record of the United States Coast and Geodetic Survey, and what the Survey is doing towards preparedness.** *Science,* May 12, 1916, pp. 671-672. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

YARD, R. S. **Glimpses of our national parks.** 37 pp.; map. Dept. of the Interior, Washington, 1915. [See also "Personal" item in this number, p. 155.]

North Atlantic States

MCADIE, ALEXANDER. **The winds of Boston and vicinity.** Diagrs. *Annals Astron. Observ. Harvard College,* Vol. 73, 1916, Part 3, pp. 211-231. Cambridge, Mass.

Professor McAdie's discussion of the winds of Boston and its vicinity forms part of the "Observations and Investigations made at the Blue Hill Meteorological Observatory in the Year 1915." This observatory is remarkably well located for the study of just such subjects as that here investigated. Blue Hill, while not high (640 feet, 195 meters), has a very free exposure; its records have now been kept for a period of over thirty years, practically without change in methods or exposure, and the highest standard of

accuracy has been maintained from the beginning. We have, in the present monograph, a very complete discussion of the winds at Blue Hill, not only as to the ordinary details of direction and velocity, but also as to the correlations between the winds and other weather conditions.

The drift of the surface currents, also of those at higher levels, is from a point slightly north of west. Wind roses show the percentages of frequency of the different wind directions seasonally and for the year. In general, months of excessive rainfall are months in which the northeast wind has a maximum duration. Dry periods are characterized by an excess of west wind. It is clearly pointed out that our Atlantic seaboard is as dry as it is because the prevailing winds blow from the land. "If it were possible to reverse the surface circulation and substitute for the west wind the east wind, the total rainfall would be 50 per cent greater and the number of rainy days exceed 250 instead of the present number, 106." This is an interesting statement. Professor McAdie introduces a new term (p. 220) when he uses *equivents* (cf. *equipluves*) for the departure of the monthly wind velocities from the norm. The relation of wind direction and temperature is strikingly illustrated by means of two figures, which are reproductions of the instrumental records. The sea breeze at Blue Hill is easily distinguishable from the cyclonic northeast wind ("sea-turn"). The latter has a greater depth and gives a more uniform decrease of temperature. It is noteworthy that a violent thunderstorm does not cool the air as effectively as does the sea-breeze (Fig. 17). Various other relations of winds are considered, e. g. winds and cloudiness, winds and pressure, variation of velocity with elevation, frequency of winds of constant velocities, etc.

Professor McAdie seems to us to have succeeded admirably in condensing a very large amount of information into a very small compass, with a commendable omission of the customary "dry" tabulations, and with an excellent series of carefully selected, clear, and interesting illustrations. R. DEC. WARD.

EUROPE

SWITZERLAND OR THE ALPS

LUCERNA, ROMAN. **Morphologie der Montblancgruppe.** 187 pp.; map, diagrs., ills. *Ergänzungsheft zu Petermanns Mitt. Nr. 181.* Justus Perthes, Gotha, 1914.

The verbal description of mountain forms is one of the most difficult problems in geography. In illustration of progress toward its solution, a comparison may be made between the description of the Mt. Blanc group by the eminent French architect Viollet-le-Duc (1877) and the present monograph, for the later work gives the most advanced and detailed statement of the thesis, already supported by Hess and others as regards trough-valleys, that the work of successive epochs and stages of decreasing glaciation is recognizable in a corresponding succession of cirques and troughs, of which the smaller and deeper ones of later excavation are "nested" in the larger and shallower ones of earlier excavation: the sharpened ridges between the cirques are thus correlated with the terminal moraines at the lower ends of the troughs. It would be hazardous to express an opinion on the correctness of this interpretation without reviewing the facts on the ground, but it is safe to say that Lucerna's study appears to be based on abundant and careful local observation and that his conclusions are well worked out. American alpinists might, it would seem, add a zest to their adventurous explorations by attempting the application of Lucerna's thesis in the strongly glaciated mountain groups of the Canadian ranges, and thus at least supplement if not replace their personal narratives with objective mountain analysis. W. M. DAVIS.

BEAUFOY, MARK. **Narrative of a journey from the village of Chamouni, in Switzerland, to the summit of Mount Blanc, undertaken on the 8th of August, 1787.** Ills. *Alpine Journ.*, Vol. 29, 1915, No. 210, pp. 323-333. [From the original manuscripts in the archives of the Royal Society, which remained unprinted until 1817. With a note, pp. 331-333, by Douglas W. Freshfield.]

BERNHARD, HANS. **Veränderungen in der Bodenkultur des Kantons Zürich.** Maps, diagr. *14. u. 15. Jahresbericht der Geogr.-Ethnogr. Gesell. in Zürich (1913-14 und 1914-15)*, pp. 3-28.

GHEZZI, C. **Die Abflussverhältnisse des Rheins in Basel.** 137 pp.; maps, diagrs., ills. *Mitt. der Abteilung für Wasserwirtschaft Nr. 8.* Dept. des Innern, Bern, 1915.

GIRARDIN, M. **Les bassins fermés des Alpes suisses.** *Bull. Soc. Fribourgeoise des Sci. Nat.*, 1913-14, Vol. 22, 1914, p. 15.

GOCKEL, A. **Das Wetter in Freiburg im Jahre 1914.** *Bull. Soc. Fribourgeoise des Sci. Nat.*, 1913-14, Vol. 22, 1914, pp. 59-65.

KNAPP, C. **A propos des premiers cartographes neuchâtelois, Josué Perret-Gentil, le Père C. Bonjour, David-François de Merveilleux.** *Bull. de la Soc. Neuchateloise de Géogr.*, Vol. 24, 1915, pp. 24-41.

MONTAGNIER, H. F. **A further contribution to the bibliography of Mont Blanc, 1786-1853.** Ills. *Alpine Journ.*, Vol. 30, 1916, No. 212, pp. 114-138. [Supplementary to the list contained in the *Alpine Journ.*, Vol. 25, 1911, pp. 608-640.]

MONTAGNIER, H. F. **Articles on the first ascent of the Jungfrau.** *Alpine Journ.*, No. 210, Vol. 29, 1915, pp. 333-336.

NÄF, J. **Graphische Darstellungen der Schweizerischen hydrometrischen Beobachtungen im Jahr 1913.** 27 plates and 14 pp. of text. *Veröffentl. der Abteilung für Wasserwirtschaft* [no number]. Dept. des Innern, Bern, 1915.

NUSSBAUM, F. **Heimatkunde von Bern und Umgebung: Orographie und Geologie.** 24 pp.; maps, diagrs. Stämpfli & Cie., Bern, 1916.

OTT, ADOLF. **Die Siedelungs-Verhältnisse beider Appenzell.** Maps, ills., bibliogr. *14. u. 15. Jahresbericht der Geogr.-Ethnogr. Gesell. in Zürich (1913-14 und 1914-15)*, pp. 35-62 + 45 pp.

ROTHEY, L. **La géographie humaine dans le Jura bernois.** *Bull. Soc. Fribourgeoise des Sci. Nat.*, 1913-14, Vol. 22, 1914, pp. 32-35.

BALKAN STATES, INCLUDING RUMANIA

FORBES, NEVILL, A. J. TOYNBEE, D. MITRANY, AND D. G. HOGARTH. **The Balkans: A history of Bulgaria, Serbia, Greece, Rumania, Turkey.** 407 pp.; maps, index. The Clarendon Press, Oxford, 1915. 8 x 5½.

Four authors have co-operated to present within four hundred pages the histories of five different nations. Forbes tells the story of both Bulgaria and Serbia, while Toynbee writes of Greece, Mitrany of Rumania, and Hogarth of Turkey. Each author worked independently, without opportunity of conferring with his collaborators, a circumstance which explains some lack of unity in style, and a certain amount of repetition in the several sections of the book. The chief merit of the volume is that it gives to the reader a valuable, up-to-date résumé of the historical background against which the tragic events of the present must be projected if an intelligent appreciation of Balkan problems is to be secured. For this purpose it may seem that the ancient history of several of the nations might profitably have been still further abbreviated.

The book is a history, not a geography of the Balkan peninsula; but the geographer will find within its pages the records of events clearly reflecting the profound influence of physical environment upon the progress of man's development in this highly interesting section of the world. Often, indeed, the connection between physical cause and political effect is explicitly stated. The rôle of parallel folded mountains bordering the Adriatic shore as an obstacle to any extension of Serbian power to the seacoast; the effect of the mountainous interior in preventing the complete subjugation of Serbia by Turkey, and in insuring to Montenegro a still greater freedom from Turkish domination; the importance of the Save-Danube channel as a military obstacle and a political frontier, and of the Morava-Maritza and Morava-Vardar trenches as guiding lines for Slavonic and other migrations: these and other distinctly geographic problems are repeatedly brought to the reader's attention, though seldom discussed at any length.

DOUGLAS W. JOHNSON.

KRUSCH, [PAUL]. **Die nutzbaren Lagerstätten der Türkei und Bulgariens und ihre Bedeutung für die Zentralmächte.** Maps. *Berliner Tageblatt: Wochenausgabe*, No. 52, Vol. 4, 1915, pp. 14-16. [Abstracted under the title "Bulgarian and Turkish Mineral Resources" in the June, 1916, *Review* (Vol. 1, pp. 459-460).]

MARTEL, E. A. **L'Albanie.** Ills. *La Nature*, No. 2209, 1916, Jan. 29, pp. 65-70.

PITTARD, EUGÈNE. **Les peuples de la péninsule des Balkans: Esquisse anthropologique.** *Rev. Gén. des Sci.*, Vol. 26, 1915, No. 23, pp. 665-675.

ITALY

ANFOSSI, G. **Volumetria della Sardegna (Studi orometrici, II).** Maps, diagrs. *Memorie Geogr.* (Suppl. to *Riv. Geogr. Italiana*) *No. 28* (=Vol. 9, pp. 183-234). Florence, 1915.

Sardinia has a volume (above sea-level) of 8,206 cubic kilometers, a mean height of 344 meters, with an area of 23,833 square kilometers. To ascertain the first two facts the author divides his island into 23 regions, the plain of the Campidano, and hill and mountain masses that are more or less separated from their neighbors by distinct valleys.

Gennargentu, near the middle of the island, is the largest and culminates at 1,834 meters. The area of each district was measured with an Amsler planimeter for each 200-meter contour of the 1:100,000 map, and from these measures the areas ascertained for each belt between contours. By Simpson's formula, if these areas are called a_0, a_1, a_2, . . . a_{n-1}, a_n, and H be the vertical distance between contours, the volume, V, will be $V=\frac{H}{3}(a_0+4a_1+2a_2+4a_3+2a_4 \ldots +2a_{n-1}+a_n)$ supposing there be an even number of areas. If there be an odd one its volume must be computed as that of a pyramid and added on.

Graphs have been computed for the slope of each district, taking areas at each 200-meter contour as abscissas and the elevations corresponding as ordinates. In another set of graphs the abscissas are the radii of the circles with the same area as the figure contained by the corresponding contour. Then profiles were platted of the boundary of each district and the mean elevation of the *base* of the district thus ascertained. Then the middle of each district was marked with its mean altitude, and, by distributing the other 100-meter elevations equally between these points and the nearest points of the coast, arbitrary contours of mean elevation are constructed.

Such are the processes that make up an orometric study. MARK JEFFERSON.

ACCOMAZZO, PERICLE. **Il Lago di Candia nel Canavese: Osservazioni fisiche e batometriche.** Diagrs., ills. *Boll. della Reale Soc. Geogr. Italiana,* Vol. 5, 1916, No. 7, pp. 575-605. Rome.

ALMAGIÀ, ROBERTO. **La cartografia del Lazio nel cinquecento.** *Riv. Geogr. Italiana,* Vol. 23, 1916, No. 1, pp. 25-44. Florence. [On maps of Latium of the fifteenth century.]

BELL, R. H. **Taormina.** xxiv and 172 pp.; ills. Hinds, Noble & Eldredge, New York, [1916]. 8 x 5. [A charming account of a quiet Sicilian town with glimpses at its environment and its history.]

BRIGG, J. J. **Through the Maritime Alps.** Ills. *Alpine Journ.,* No. 210, Vol. 29, 1915, pp. 300-311.

BRUNO, A. **Il transito attraverso i porti italiani del commercio con l'Africa.** *L'Africa Italiana,* Vol. 34, 1915, No. 8, pp. 206-216; No. 9, pp. 291-295. Naples.

CALIMANI, FELICE. **I profughi di guerra italiani rimpatriati attraverso alla Svizzera.** Maps, ills. *Boll. della Emigrazione,* Vol. 15, 1916, No. 3, pp. 5-35. R. Commiss. della Emigr., Rome.

—— **Emigrazione italiana transoceanica negli anni 1914 e 1915. Notizie statistiche riassuntive sulla, e operazioni relative di vigilanza e di tutela del Commissariato della Emigrazione.** *Boll. della Emigrazione,* Vol. 15, 1916, No. 2, pp. 3-51. R. Commiss. della Emigr., Rome.

FIORE, OTTO DE. **I fenomeni avvenuti a Volcano (Isole Eolie) dal 1890 al 1913.** Diagr., bibliogr. *Zeitschr. für Vulkanologie,* Vol. 1, 1914, No. 2, pp. 57-73; Vol. 2, 1915, No. 1-2, pp. 12-66.

HESS, ADOLFO, AND M. C. SANTI. **La Torre di Lavina m. 3308 (Gruppo del Gran Paradiso).** Ills., bibliogr. *Riv. Mensile Club Alpino Italiano,* Vol. 35, 1916, No. 1, pp. 14-21.

HUTTON, EDWARD. **Naples and southern Italy.** xi and 312 pp.; ills., index. The Macmillan Co., New York, 1915. $2. 7½ x 5. [A book of more than ordinary charm. It subordinates present-day descriptions. Side lights from history, the doings of great men, events out of the common that stamped each place or region with character and gave it a distinctive atmosphere are the main themes.]

KEBLINGER, WILBUR. **Malta.** *Suppl. to Commerce Repts.,* Ann. Series, 1916, No. 20a, pp. 5-8. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

LOTTI, B. **Le tremblement de terre de la Marsica dans l'Apennin central.** Ills. *La Nature,* No. 2215, 1916, Mar. 11, pp. 161-163.

MASON, C. A. **The spell of southern shores, or from sea to sea in Italy.** x and 428 pp.; ills., index. The Page Co., Boston, 1915. $2.00. 8½ x 5½.

MODERNI, POMPEO. **Su la conca di Bolsena: A proposito di una nota del Dott. H. Simotomai.** Diagrs. *Boll. del R. Comitato Geol. d'Italia,* Vol. 45, 1915, No. 1-2, pp. 93-108. [On the "crater lake" of Bolsena, 50 miles northwest of Rome. The article to which this is a rejoinder appeared in the same journal, Vol. 44, 1914, No. 2.]

—— **Servizio Meteorologico, Norme ed istruzioni per il.** 61 pp.; diagrs., ills. *Ufficio Idrografico Pubbl. N. 53.* R. Magistrato alle Acque, Venice, 1916.

VIÉZZOLI, FRANCESCO. **La Venèzia Giùlia.** Map. *La Geogr.*, Vol. 3, 1915, No. 7-10, pp. 242-294. Novara.

VITALE, L. **L'Adriatico, mare nostro.** *L'Esplorazione Commerc.*, Vol. 31, 1916, No. 6, pp. 206-222.

AFRICA

South Africa

—— **Cape Province, Development of irrigation in.** *Board of Trade Journ.*, No. 1,031, Vol. 94, 1916, pp. 639-640.

CLERICI, ALESSANDRO. **Igiene e medicina tropicale: Risorse naturali dell' Africa sud-occidentale tedesca.** *Riv. Coloniale*, Vol. 11, 1916, No. 7, pp. 399-404.

CORDEAUX, H. E. S. **St. Helena: Report for 1915.** 18 pp. *Ann. Colonial Repts. No. 896.* London, 1916.

DORNAN, S. S. **Rhodesian ruins and native tradition.** Ills. *South African Journ. of Sci.*, Vol. 12, 1916, No. 11, pp. 502-516. [Abstracted in the January *Review*, p. 72.]

DYE, J. W. **Cape Town.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 66a, pp. 8-13. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

ELLENBERGER, J. **Bechuanaland Protectorate: Report for 1915-1916.** 7 pp. *Ann. Colonial Repts. No. 898.* London, 1916.

FOX, H. W. **The development of Rhodesia from a geographical standpoint.** Map, ills. *Geogr. Journ.*, Vol. 48, 1916, No. 4, pp. 289-305.

GUNSAULUS, E. N. **Johannesburg.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 66a, pp. 13-23. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

GUNSAULUS, E. N. **Rhodesia.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 66a, pp. 23-31. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

GUNSAULUS, E. N. **Union of South Africa.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 66b, pp. 5-14. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

HEISLER, C. H. **British South Africa.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 66a, pp. 1-8. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

KEHOE, D. **The influence of the climatic and tellurical factors on the distribution and spread of certain animal diseases, with special reference to the conditions occurring in South Africa.** *South African Journ. of Sci.*, Vol. 12, 1916, No. 11, pp. 474-501.

KINGON, J. R. L. **Native agriculture.** *South African Journ. of Sci.*, Vol. 12, 1915, No. 5, pp. 178-191.

KINGON, J. R. L. **The economics of the east coast fever as illustrated by the Transkeian Territories.** *South African Journ. of Sci.*, Vol. 12, 1916, No. 6, pp. 213-226. [The Transkei Territories lie "beyond" the Great Kei River on the east coast of the Cape of Good Hope province. The article is abstracted in the January *Review*, pp. 72-73.]

MARLOTH, RUDOLF. **The effects of droughts and of some other causes on the distribution of plants in the Cape region.** *South African Journ. of Sci.*, Vol. 12, 1916, No. 9, pp. 383-390. [Records the effect of the remarkably severe drought of 1914 in the Cape peninsula. The author's observations confirm the importance of the south-east mountain cloud as a source of moisture.]

MASTERSON, W. W. **Durban.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 66a, pp. 37-39. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

MULLER, H. P. N. **Did Holland sell the Cape?** *Tijdschr. van het Kon. Nederl. Aardrijk. Genoot.*, Vol. 33, 1916, No. 5, pp. 661-664.

MURPHY, G. H. **British South Africa.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 66b, pp. 1-5. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

PETTMAN, CHARLES. **An inquiry into the derivation of certain South African place-names.** *South African Journ. of Sci.*, Vol. 12, 1915, No. 5, pp. 159-170. [Amongst the names is that of Walvis Bay. This form of spelling, authorized by the

Government, has aroused much etymological discussion. The author is satisfied that the earliest of the many forms is that of Walvisch Baai, which appears on Rochette's map of 1782.]

SCHWARZ, E. H. L. **The fault systems in the south of South Africa.** *South African Journ. of Sci.*, Vol. 12, 1916, No. 9, pp. 367-382.

SPENCE, J. O. **Mozambique province.** 6 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 76a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

STEWARD, T. A. **Swaziland: Report for 1915-16.** 15 pp. *Ann. Colonial Repts. No. 901.* London, 1916.

TOIT, P. J. DU. **South African agriculture: An analysis.** *South African Journ. of Sci.*, Vol. 12, 1915, No. 5, pp. 145-155. [The principal agricultural industries are briefly surveyed, some attention being paid to the complicated human factor in the history of the development. That population is a prerequisite for further expansion is the conclusion of the writer.]

VERSFELD, WILLEM. **Notes on the chemistry of the !naras (*Acanthosicyos horrida hook.*).** Ills. *South African Journ. of Sci.*, Vol. 12, 1916, No. 6, pp. 232-238. [The !*naras* (! represents a palatal click) is a cucurbitaceous plant flourishing in the dune region round Walvis Bay. The features of its habitat are a dry, warm climate, incessant winds, loose sandy soil extraordinarily rich in potash, and a good deep-seated water supply. In its adaptation to desert conditions the plant has naturally become highly specialized. It is characterized by enormous roots and the elimination of leaves. It produces as fruit a small melon, an excellent nutritive food which with fish forms the exclusive diet of the Hottentot and Bushmen dwellers of the region. (See also reference in the note on "The Physical Subdivisions of Southwest Africa" in the August, 1916, *Review*, pp. 155-156.)]

WAKEFIELD, E. A. **Port Elizabeth.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 66a, pp. 32-37. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

ASIA

TURKEY IN ASIA, ARABIA, CAUCASIA, IRAN

WARFIELD, WILLIAM. **The gate of Asia: A journey from the Persian Gulf to the Black Sea.** x and 374 pp.; ills. G. P. Putnam's Sons, New York and London, 1916. $2.50. 8½ x 6.

At the beginning of his book Mr. Warfield states that the object of his expedition "was to pursue certain scientific studies" because he believes that "the unnoticed and comparatively insignificant mountains of Kurdistan form an important link between the mountain systems of Europe and Asia." The reader is nowhere troubled by these scientific studies, however, for the author devotes himself almost exclusively to a pleasant account of his experiences, interlarded with discussions of history. Before the war he started from the head of the Persian Gulf, went up the Tigris to Bitlis and Van, and came back to civilization by way of Urmi and the Russian Caucasus. His volume is a typical book of travel. No remarkable adventures were experienced, no new routes were traversed, and no discoveries were made. Nevertheless it is worth reading.

Certain little episodes are highly illuminating. For example, Mr. Warfield saw an old Nestorian woman who was stolen from her Christian home in childhood, lived in a Kurdish harem, and had not seen a Christian for sixty years. He entertains no very high idea of the Armenians, although he acknowledges their ability. He thinks that the village Armenians are largely of Parthian descent, and that the town Armenians are partly Jewish. The Kurds and Yezidis seem to appeal to him. His descriptions of people are excellent.

One of the few scientific points upon which Mr. Warfield expresses an opinion is changes of climate. Many facts, such as the vast armies of Darius, and still more the fact that he brought to Arbela fifteen elephants from the present deserts on *this* side of the Indus, "provide one of the most striking proofs of the tremendous variations which have taken place in the climate of the whole northern hemisphere in historic times." He states that "conditions in the southern hemisphere are of course the exact opposite" of those in the northern, but of this he gives no proof.

ELLSWORTH HUNTINGTON.

BADER, R. H. **Persia.** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 57a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

CAPRA, GIUSEPPE. **La colonizzazione agraria in Siria e Asia Minore.** Ills. *Italica Gens*, Vol. 6, 1915, No. 3-6, pp. 65-89. Turin.

FRANCHETTI, LEOPOLDO. **Il futuro assetto dell' Asia Minore e le giuste aspirazioni italiane.** *L'Esplorazione Commerciale*, Vol. 31, 1916, No. 8, pp. 290-292.

LUKACH, H. C. **Cyprus: Report for 1915-1916.** 23 pp. *Ann. Colonial Repts. No. 903.* London, 1916.

RAEBURN, HAROLD. **A further list of peaks ascended in the Central Caucasus in 1912, 1913, 1914, and 1915.** *Alpine Journ.*, No. 212, Vol. 30, 1916, pp. 194-196.

SCHULTZ, ARVED. **Afghanistan: Auf Grund einer Reise des Persers Rustam-bek.** *Petermanns Mitt.*, Vol. 62, 1916, Sept., pp. 330-333.

TOTAH, K. A. **Palestine and the Allies.** *Journ. of Race Devel.*, Vol. 6, 1916, No. 3, pp. 315-323. [Russian pilgrim, French economist, British politician have had interests in the Holy Land.]

WATSON, A. G. **Aden.** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 49a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— ***Asia, 1:1,000,000. Compiled at the Royal Geographical Society under the direction of the Geographical Section of the General Staff.*** Sheets: North—I—38, ***Bagdad***; North—K—37, ***Batum***; North—I—36, ***Beirut***; North—J—37, ***Erzerum***; North—J—35, ***Izmir (Smyrna)***; North—J—36, ***Konia***; North—K—36, ***Sinob***; North—J—38, ***Tabriz.*** War Office, London, 1916. [These sheets represent a southeastern extension of the Map of Europe, 1:1,000,000, discussed in detail in the *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 776-777.]

—— ***Asia Minor, Egypt, Mesopotamia and Persia, Bartholomew's map of.*** 1:4,000,000. John Bartholomew & Co., Edinburgh, 1916. [Excellent hypsometric map on a relatively large scale. The altitude tints, in the pleasing greens and browns generally employed by this firm, are bounded by the following contours: 0, 500, 1,000, 1,500, 2,000, 3,000, 6,000, 10,000, and 15,000 feet.]

—— ***Syrie, Carte de la (partie septentrionale), dessinee d'apres les cartes hydrographiques de la Marine francaise, le Palestine Found*** [sic], ***les itineraires de E. G. Rey, de Max Blankenhorn*** [sic], ***Sachau, Diener, les cartes de H. Kiepert, le Guide de Terre Sainte du P. Barnabe, et les documents les plus recents.*** 1:400,000. Inset: Plan de Beyrouth. 1:25,000. Missions Catholiques, Lyons, 1915. [Relief in brown shading.]

—— [***Turkey, etc.:***] ***Les operations russo-turques: Mer Noir, Crimee, Caucase, Dardanelles.*** 1:850,000. Berger-Levrault & Cie., Paris, [1916].

WORLD AS A WHOLE AND LARGER PARTS

FERNOW, B. E. **A brief history of forestry in Europe, the United States, and other countries.** 3rd revised edit. xi and 506 pp.; index. American Forestry Assoc., Washington, D. C., 1913. $2.50. 8 x 6.

Why a history of forestry? Doctor Fernow gives the answer and the history.

The need of wood is universal, but the form that the forest problem takes varies from place to place and from time to time. It varies locally within the same country because of many conditions, prominent among which are the means of transport, the local abundance of trees or of men. Changes in one of many factors may make a new forestry situation.

Thus, the people of the eastern United States in 1800, though scanty in number, developed in some localities a keen appreciation of forest care because they depended on wood for fuel and timber and had only wagons and rivers for transport. Then came the railroad and the steamship, and the Pennsylvania farmer, like the people of England, drew upon the world. Forest care was forgot in the sense of plenty that the world market gave.

That sense of plenty is passing, never to return. The north temperate zone contains the world's important forests, for, as Doctor Fernow well points out, the tropical woods are so hard that their uses are ornamental rather than economic. Of this temperate-zone forest, 800,000,000 acres are in Europe, 800,000,000 in Asia, and 900,000,000 in North America. Already all Europe, except Norway, Sweden, Russia, and Austria-Hungary, is importing, and North America with its heavy industrial development has made a wood scarcity in an amazingly short time. This present economic life of ours, despite the seeming mitigation of invention, demands ever-increasing piles of wood. Even Germany, the fatherland of forestry, now imports a sixth of her supply and, like other European countries, increases her demand 1½ to 2 per cent per year. This import to Germany comes in spite of the experience of centuries, with 25 per cent of her area in forests, nearly all well cared for and with the unusual output of over 50 cubic feet of wood per acre per year.

The ray of hope for the race lies in the fact that only 10 per cent of the temperate-zone forests, 250,000,000 acres, are under any care that may be called forestry. This is not a quick hope, as shown by the experience of the city of Nürnberg in one of the first recorded cases—a crop of pine, spruce, and fir was planted in 1368, and harvested in 1449, eighty-one years later.

Germany, populous and inaccessible (in comparison to the rest of Europe), early felt the need for forestry. Her scores of states and cities with independent forest administrations have made her a storehouse of experience, practice, and schooling. This and the experience of the rest of the world has been brought together in good German style by one eminently fitted for it, Professor Fernow, brought up in the schools and atmosphere of Germanic forestry and fortified by decades of observation, practice, and teaching in America.

J. RUSSELL SMITH.

MATHEMATICAL GEOGRAPHY

ASTRONOMICAL GEOGRAPHY

CHAMBERLIN, T. C. **The origin of the earth.** xi and 271 pp.; diagrs., ills. (The University of Chicago Science Series.) University of Chicago Press, Chicago, 1916. $1.50. 7½ x 5.

This book is an interesting illustration of where one may be led in a scientific research. An inquiry into the cause of the Ice Age led to an investigation of the origin of the atmosphere and from that to the origin of the solar system. The nebular hypothesis proving unsatisfactory, the author advanced what he has called the "planetesimal hypothesis." This was first published in 1897; since then many papers have been written in developing the hypothesis into a theory. This volume is the first general exposition of the theory that has appeared.

The matter may be divided for review into four parts: (1) criticism of the nebular hypothesis ;(2) development of a spiral nebula by the close approach of two stars, and its evolution into the solar system; (3) origin of the larger features of the earth; (4) speculations on the beginnings of life.

(1) The nebular hypothesis was never developed into a theory; and during the second half of the last century so many objections were found to it in the exact form given by Laplace that astronomers looked to the irregular nebulæ and later to the spiral nebulæ as a more probable prototype of the solar system. The author and Professor T. R. Moulton, his collaborator, showed that the distribution of mass and momenta in the solar system were not compatible with the usual simple assumptions of Laplace's hypothesis; they also emphasized the difficulty offered by the nearly universal forward rotation of the sun, the planets, and their satellites.

(2) The solar prominences consist of matter erupted from the sun by some not clearly understood force. The author assumes that, if the pressure a little below the sun's surface could be reduced, a sufficient mass would be ejected to form the planets and their satellites, which, all told, only amount to about 1/745 of the sun's mass. The author ascribes to the tidal forces due to the approach of a star the role of reducing the pressure.

There are three objections to this hypothesis: (a) The cause of the eruptions is unknown, and therefore a reduction of pressure might or might not increase their violence. (b) The action of the tidal forces is inadequately described; the radial components of these forces have little effect in producing the tides, which are principally due to a heaping up of matter from the surrounding regions by the actions of the tangential components of the forces; and they are more apt to cause an increase than a decrease of pressure on the levels from which the eruptions start. (c) The author does not tell us how large the star must be, nor how near the sun it must come, but he speaks of it as "massive" and its approach to the sun as "quite distant." In his "Geology," he instances a star of the same mass as the sun and the nearest approach about ⅔ the distance of Neptune. The maximum ratio to the sun's gravity of the tidal forces on the sun (due to this star) is one part in 32,000 million. If the star had four times the mass of the sun and approached to within half the above distance, the ratio would only be one part in a thousand million. Does any one doubt that the ordinary storms on the sun cause much greater changes in the pressure than this would?

Assuming, however, that the ejections from the sun have occurred as described by the author, the theory accounts for the revolution of all the planets in the same directions and approximately in the same plane, and shows that the growth of the planets, by impact with small masses (planetesimals), would tend to reduce the eccentricities of the orbits, but it may be doubted whether this could produce the very nearly circular orbits which all the planets describe. One of the most serious faults of Laplace's

hypothesis, according to the author, is that it would require retrograde, and not forward, rotations of the planets and revolutions of their satellites. The author explains the forward rotations and revolutions as the result of impact of planetesimals on the growing planet; and points to the relative sizes of certain shaded areas in his Figure 7 as "essentially decisive" of this. These areas have apparently been drawn on the erroneous impression that the direction of the impulse is in the direction of motion of the plane at the moment of impact. When the true direction of the impulse is determined by the instantaneous change in velocity, it is found that the effect of the impacts is merely to reduce the speed of rotation of the planet, in whatever direction that rotation may have been. So that the direction of the axes and the directions of rotation of the planets depend on the way the matter was erupted from the sun, of which nothing is known; and the nearly universal direct rotations are not accounted for by this theory. The author apparently recognizes the accidental directions of rotation of the larger planets (p. 154).

(3) The earth is supposed to have grown by slow accretions of planetesimals, which cooled rapidly by radiation on account of their small size. The interior heat is ascribed to a contraction of the mass, and a surface temperature gradient to heat brought by molten rock from the deep interior and to radio-activity. Somewhat plausible reasons are given why the heavier matter found lodgment in the depressed regions, and, by greater compression there, made the positions of the oceans and continents permanent.

The rate of rotation of the earth is supposed, towards the end of its growth, to have been diminished by accretions, and the depression near the equator and elevation near the poles, necessary for adjustment to the new figure of equilibrium, are supposed to be accomplished, not by plastic flow, but by fractures of the earth into great segments. By analogy with the jointing of basalt columns (!) the author thinks there would be three great fractures at each pole, and that the whole earth would be broken up into six segments, diamond-shaped at the earth's surface, and interlacing in the equatorial regions; and that these segments would sway on their apices at the earth's center, adjusting the earth to its proper figure. As the earth shrinks, crushing occurs on the land segments along the lines of junction of the segments, and mountain chains are formed. The reviewer is quite incapable of understanding how the almost perfectly ellipsoidal shape of the earth could be brought about by such movements of the segments; nor do the fracture lines drawn by the author, more numerous than required by the original analogy, follow the great structure lines of the earth; new hypotheses have to be introduced to account for these discrepancies. The three heavy segments of the North and South Pacific and the Indian Oceans are supposed, by their weight, to have forced the segments opposite to them to yield, "and by such yielding to have formed the land hemisphere," a perfect analogy to a man's lifting himself by his own boot straps. In describing the certain forces which increase toward the earth's center the author writes: "Their action was not unlike a vial closing from below," though, of course, the forces acting on a body in the jaws of a vise are the same whichever jaw approaches the other. But perhaps the author should be forgiven this error, for it is remarkably prevalent in geologic literature.

The author recognizes the purely speculative character of many of his ideas, and writes: "We are painfully conscious of the high probability that we have fallen into some misconceptions, perhaps not a few, and have entertained views that will need to be rectified."

HARRY FIELDING REID.

EDUCATIONAL GEOGRAPHY

HAWORTH, ERASMUS, AND OTHERS. **Should a new degree be created for proficiency in geology?** *Economic Geol.*, Vol. 11, 1916, No. 1, pp. 73-86. [Opinions elicited by a circular letter on this question.]

KELTON, M. E., AND C. W. HOTCHKISS. **An experiment in fourth-grade geography.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 7, pp. 245-251.

KIRCHWEY, C. B. **Geography in the junior high school: Its relation to elementary school and to senior high school geography.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 8, pp. 291-294.

LANGEN, GUSTAV. **Die städtebaulichen Einheitspläne als Lehrmittel.** *Geogr. Anzeiger*, Vol. 16, 1915, No. 11, pp. 331-334; No. 12, pp. 364-367.

MCARTHUR, L. A. **Accuracy in geography.** *Masama*, Vol. 4, 1915, No. 4, pp. 40-47. [Deals with the work of the U. S. Geological Survey and the U. S. Coast and Geodetic Survey, and the giving of geographic names, mainly with reference to the Pacific Northwest.]